The
Electrical Review

VOL. CXVIII. MARCH 27, 1936. No. 3044.

THE OLDEST ELECTRICAL PAPER. ESTABLISHED 1872.
Published every FRIDAY. Price 6d.

THE ELECTRICAL REVIEW, DORSET HOUSE, STAMFORD STREET, LONDON, S.E.1.

Telegraphic Address: "AGEEKAY, SEDIST, LONDON." Code, A B C. Telephone No.: Waterloo 3333 (50 lines).

The "Electrical Review" is the recognised medium of the Electrical Trades and has by far the largest Circulation of any Electrical Industrial Paper in Great Britain.

SUBSCRIPTION RATES, Postage Free: United Kingdom, £1 14s. 8d. Canada, £1 12s. 6d. Colonial and Foreign, £2 1s. 6d. per annum. Cheques and Postal Orders (on Chief Office, London) to be made payable to ELECTRICAL REVIEW, LTD., and crossed "Lloyds Bank."

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Confidence in E.D.A.

TWO things stand out very plainly as the result of our most careful consideration of the proceedings of the Electrical Development Association at the Savoy Hotel on Friday last.

First, during the past year the Council had to devote a great deal of time to exceptional matters of a somewhat difficult nature, in addition to fulfilling its ordinary duties. Secondly, the Association generally has complete confidence in its Council and is prepared to leave it unhampered, at any rate at present, by too critical questionings concerning its future policy for strengthening the organisation.

In the main, the speeches delivered at the luncheon by Sir Harry Brittain and Viscount Falmouth dealt with matters with which electrical men are perfectly familiar, from constant reiteration. That there is a good time coming when, in an Electrical Age, electricity will touch us all at practically every stage of human existence from the cradle to the crematorium, we all believe; in points of detail we differ concerning when that Age will dawn, and as to the best methods to employ to accelerate the pace of progress.

The great thought of common interest upon which stress was appropriately laid, both at the annual luncheon and at the meeting which followed, was the urgent need for every electricity supply authority to make a contribution to the effort to educate the public by means of efficient advertising propaganda. Last year E.D.A. expended £90,000 on organised publicity, and one-half of that sum came from the Central Electricity Board. Compared with the advertising outgoings of ordinary businesses and of electricity's chief competitor, the amount is absurdly small.

How to increase the funds so that this state of things may be altered continues to be one of our most pressing problems, demanding a constructive policy from men fully conversant with the situation. The readiest solution, of course, is for all supply interests to back up the movement by becoming members. The official reply to those who ask how this is to be done is found in the Council's strong conviction that as the Association becomes stronger and more efficient non-members will see the necessity for joining the circle. We have been waiting many years for this desideratum to be reached. Practically all the querulous criticisms and questionings that we receive from impatient correspondents are accounted for by the continued lack of financial support, or by members' failure to take advantage of the facilities that are at their command for the asking.

As our readers know, the organisation has been strengthened in recent times by adding to the staff experts on special subjects such as industrial heating, and it is the intention of the Council still further to increase the usefulness of the Association, and thus make it attractive. We wish every success to efforts which will be continued during 1936 to this end.

The Men of the Hour

The Electrical Development Association is certainly fortunate in the men who have been settling many difficult matters at innumerable, more or less private, conferences, while Mr. Cramb, the Director of the Association, and his staff, have been getting on with the mass of general work. We do not suppose that the electricity supply industry would be willing for so little to be publicly revealed as a general rule, but the circumstances have been exceptional, and at the moment satisfaction is general. Rumours and false reports are always prevalent when things cannot be freely discussed, and only an electrical editor knows the restraint which good taste and the circumstances impose upon him at such a time. Mr. P. J. Robinson has proved himself to be in every way the man for 1935-36, acting, as he says, in close co-operation with such eminent electricity supply experts as Mr. C. D. Taite and Mr. H. C. Lamb. Special knowledge of recent events and his active part in the reorganisation measures of a few years ago fully qualify Mr. Taite for occupying the chair in the current year. It will not be a year of freedom from problems, but with Mr. Robinson and Mr. Lamb still available, and with Lord

Eltisley, with his knowledge of affairs, as president, there is every reason to believe that a year hence the chairman of the Council will be in a position to report difficulties overcome, an accession of strength to the organisation, increased revenue, increased national advertising, and, of course, the complete success of the million-more-consumers campaign.

Seeking New Outlets

FROM the middle of 1932 until the end of 1935 there has been a continuous improvement in the output of the generating stations in Canada, after the setback of the previous two years. The Census of Industry in Canada for 1934, which we have received this week, records that the kWh produced in that year was 21,197 million—an advance of twenty-two per cent. over 1933 and seventeen per cent. over the previous peak year (1930). Of the 3,600 million kWh increase of 1934 over 1933 nearly 1,600 million kWh was due to further connections of electrode boilers, which took 5,337 million kWh, or more than a quarter of the energy sold. All but one-tenth of this goes to pulp and paper mills, which, with motive power and lighting, absorbed nearly two fifths of the total output of all the stations. While we have not an equivalent basic industry in Great Britain, or quite the same need to meet high standing charges on idle plant (ninety-eight per cent. of electricity produced in Canada comes from water-power), this result provides an example of what can be attained by going out after loads that were hardly thought of a few years ago.

Cinematography and X-Rays

PROBABLY X-rays are used as much for curative purposes as for diagnosis, as was mentioned during the discussion on Dr. R. J. Reynolds's I.E.E. paper last week, but the technique developed by the author, an individual experimentalist, should open up a wide field for the study of disease, and so restore, for the time being at any rate, the premier position of the original application of X-rays. More than forty years have elapsed since Röntgen discovered the properties of X-rays, one year later than the Edison cinema and a year before the Paul shutter, the main difficulty having been to obtain sharp definition and speed with a safe X-ray intensity. The indirect method of Dr. Reynolds, the efficacy of which was indicated by some excellent films, appears to overcome these difficulties and also to be economical enough for general application. Another important advantage which it possesses is permitting demonstrations of the working of the human internal mechanism to larger numbers of students than was once practicable. No doubt cine-radiography will extend its scope, just as X-ray photography did before it, into the industrial field, though here its potentialities would probably be more limited.

Co-ordination in London

London Associated Electricity Undertakings, Ltd., was formed in February last year to acquire the capital stock of six concerns supplying electricity mainly in the west of London. It was a move which we welcomed at the time, for development in the areas of these companies had been uneven, to say the least, and we considered that unification of the systems and methods of charging would fairly quickly operate to the advantage of both the companies and their consumers. The combine's first report was reviewed in our last issue, and it showed that while the connected load had increased by 8.76 per cent. the sale of energy rose by 11.33 per cent., indicating the beginning of intensive development. Speaking at the annual meeting on Thursday, last week, the chairman, Lord Wargrave, mentioned that this rather large financial merger had cost only £7,300. Already the lighting rate had been reduced in two areas, while a uniform two-part tariff and standardised conditions of supply and hire systems had been applied in all six areas. The next move was towards uniform hire-purchase and other consumers' assistance schemes. Economy in purchasing had also been achieved. Mr. C. Parker, joint managing director, mentioned that the average price per kWh sold had fallen from 1.804d. to 1.682d.

Good Tidings

We are accustomed to reading reports of substantial progress by electricity supply companies, but it is a long time since we were able to rejoice in such a long succession of happy returns from electrical manufacturing companies as we have had this year. Of course, cable makers generally do well, but even so, the rise of £114,000 in the profit of British Insulated Cables, Ltd., is out of the ordinary. The directors attribute it to increased turnover, new plant and buildings, and increased efficiency. A cash bonus of 5 per cent. is being distributed to the ordinary shareholders in addition to the maintained 15 per cent. dividend. The British Thomson-Houston Co., Ltd., had an excellent year, its profit rising by over £120,000. In this case "improved industrial conditions" are stated to have been responsible, and the dividend is increased from 3 to 5 per cent. Another member of the Associated Electrical Industries group—the Edison Swan Electric Co., Ltd., which has had its vicissitudes, also reports considerable improvement. The increase of £34,000 in the trading profit represents a rise of 60 per cent., and is therefore better, proportionally, than the other two instances mentioned above. The improvement in the dividend is correspondingly greater—from 6 to 10 per cent. The A.E.I. itself reports a jump of £241,000 in profits, and is paying a dividend of 8 per cent., against 6 per cent. for 1934.

The "Queen Mary"

THE *Queen Mary* sailed from the Clyde for Southampton on Tuesday, preparatory to starting on her maiden voyage to the United States on May 27th. The electrical equipment on board matches the symbolical significance of this vessel in the eyes of the public, as we know of no vessel afloat on which electrical appliances have been fitted for so great a variety of purposes, and certainly none on which the electrical installation for hotel services is of such magnitude, quite apart from the auxiliary power (practically all electrically driven), including that required in connection with the main propelling plant. The galleys provide the biggest hotel load, on account not only of the capacity of the cooking apparatus, but also the unusual extent to which electricity is used in the kitchens to facilitate general service. We give in this issue a few preliminary particulars of the electrical feaures in advance of those we anticipate publishing at greater length nearer the official date of the liner's departure.

A Scottish Scheme Rejected

THE House of Commons last week rejected on second reading the Caledonian Power Bill which aimed at developing water power in Inverness and Ross and Cromarty for the purpose of manufacturing calcium carbide. The promoters claimed that only with a supply of cheap hydro-electric power could they produce the chemical economically and they sought assistance to the extent of (it was stated) £20,000 a year by being relieved of the payment of rates on the undertaking. Some opposers objected to what they termed a "subsidy"; others considered that greater national advantage would accrue if the new industry were established in a distressed area and used coal-produced electricity or obtained power from the Lochaber Power Company; while further opponents feared that the natural beauty of the part of Scotland concerned would be spoiled. The Lord Advocate (Mr. T. M. Cooper) admitted that there were "grave defects" in the Bill, but thought that these could be remedied in Committee. In spite of this the Bill, as stated, was rejected by 199 votes to sixty-three.

New Northern Ireland Transmitter

THE new B.B.C. Northern Ireland Regional transmitting station officially opened by the Duke of Abercorn on March 20th is about two miles south-west of Lisburn, the site having been chosen due to its proximity to the centre of gravity of the more densely populated areas and because it is convenient to the necessary public services.

Electricity is purchased in bulk from the 33-kV system of the Electricity Board for Northern Ireland; the intake supply is duplicated. The brick building, which has been constructed by Messrs. Stewart & Partners, is heated by hot-water radiators, automatic temperature control being obtained in the transmitter hall and machine rooms by means of magnetic stop valves which are actuated by suitably placed thermostats. The water is heated electrically in two Bastian & Allen electrode circulators, the loading of each being 225 kW on a 415-V 3-phase circuit. The water is heated only during non-transmitting hours (from midnight until 9.30 a.m.) with the result that a very high overall load factor is obtained. A 10,000-gal. storage tank is used, the heat insulation being effected by a 3-in. covering of glass wool and asbestos. The scheme for heating the water was devised and installed by the Electricity Board for Northern Ireland.

Throughout the station all important plant is duplicated and means have been provided to secure rapid change-over from any machine to its associated standby. A Harland & Wolff 600-h.p. Diesel-engine driven alternator has been installed for use in the unlikely event of failure of external supplies. Means of synchronisation have been provided so that, when required, the load can be readily transferred from one source of supply to another without the necessity for a shut down.

The wave-length of the station is 307 metres, and the maximum power permitted by the Lucerne plan for a station broadcasting on this wavelength is 100 kW. The station will thus be the highest-power medium-wave transmitter in the British Isles. The circuit of the transmitter is similar in general design to that of the long-wave national transmitter at Droitwich, the Marconi system of series modulation being employed. The various power supplies required by the transmitter are delivered from motor-generator sets driven from the main supply.

General view of the transmitter hall showing the transmitter, the power-control unit and the power input switchboard, and (right) the auxiliary-anode-supply and grid-bias generators, one of the main high-tension generators and the power-input switchboard in the machine room

In the machine room is the principal high-voltage and auxiliary converting plant. There are three h.v. generators of "English Electric" manufacture, each of 300-kW capacity at 12,000 V and driven by a synchronous motor, two equipments being normally connected in series so as to obtain the requisite voltage (18,500-20,000 V) for the anodes of the power valves. The third unit is a standby: the transmitter can be run at reduced power by one generator operating at 12,000 V.

The practice of using high-voltage d.c. generators is entirely British in origin and the very successful results obtained in this and other stations reflect great credit on all concerned. The usual practice abroad is to use high-voltage mercury arc rectifiers with consequently larger smoothing plant. The auxiliary equipment, also contained in the machine room, consists of motor-generator sets for the provision of anode voltages for the low-power valves and the grid bias voltages for all valves.

Motor-generators are also used to provide filament current to all the valves, the generator equipments being housed in a vault under the transmitter hall. Each power valve has a separate motor-generator set for its filament, which permits very accurate adjustment of filament voltage and avoids the use of long heavy-section busbars. Standby sets are provided, the change-over from one to another being effected by contactors which close automatically when the motor has reached full speed.

With the series modulated system the filaments of the modulated amplifier valves are at a potential of 10,000 V above earth in the unmodulated carrier condition, and it is therefore necessary to insulate the generator supplying the filament current. This has been done by mounting it on porcelain supports and driving it through a porcelain coupling.

The transmitter hall contains the Marconi transmitter, the control desk, and the switchboard for the synchronous motors driving the 12,000-V generators, as well as the smoothing condensers for the anode supply to the power and other stages. With the exception of the synchronous motors referred to above, all motors are started by means of remote control

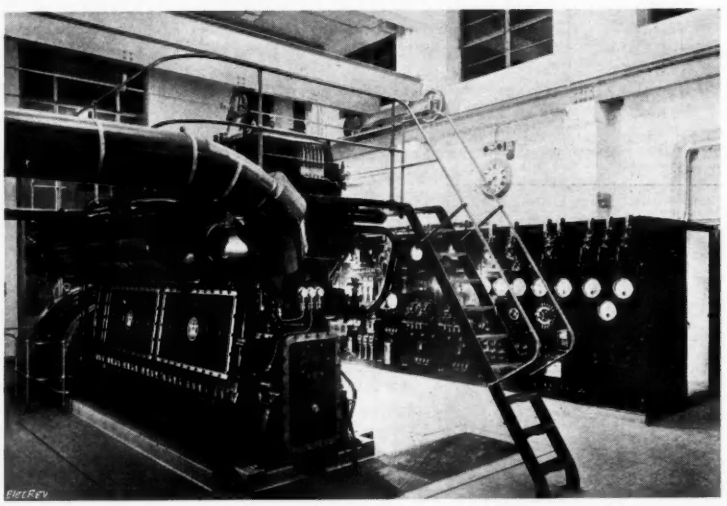
apparatus from the control desk. In addition, all field regulators are motor operated and remotely controlled.

The transmitter consists, first, of two low-power l.f. stages, the second of which feeds into the modulator stage. High frequency input is provided by a Marconi constant-frequency valve oscillator, which, as in the case of other valves, is duplicated, both as regards itself and its connections, for standby purposes.

The h.f. input is fed through an amplifier stage to the modulated amplifier stage. The valves in this are connected in series with the modulator valves and with the source of h.v. supply, the anode circuit of the modulator stage being connected to the filament circuit of the modulated amplifier stage. In this way variations in the impedance of the modulator anode circuit due to low-frequency variations in its grid voltage cause the effective h.v. applied to the modulated amplifier anodes to vary in sympathy, thus effecting the modulation process.

The main amplifying stage has a power output of 100 kW at a modulation depth of 90 per cent., with total harmonic content not exceeding four per cent. It consists of four 25-kW water-cooled valves, two being connected in parallel on each side of a push-pull circuit. A spare valve is also provided on each side of the push-pull circuit. The water cooling is effected by a closed circuit of distilled water, which is circulated by motor-operated pumps controlled from the control desk through a large mains water-cooled radiator which is mounted over a reservoir adjacent to the main building.

The output circuit comprises a radio frequency transformer coupling the balance anode circuit to a concentric tubular feeder, which conveys the high-frequency energy to the aerial transformer house. The tubular feeder is mounted on porcelain spiders inside the concentric external copper tube, which acts as a screen. The transmitter, contrary to usual practice, is built in one large unit and sub-divided internally. Glass panels are used so that the complete equipment can be seen from the transmitter hall.



The stand-by Diesel-generator plant in the power house; the power switchboard can be seen on the right

The transmitter hall is lighted by means of eight lanterns each containing a 1-kW lamp. Special frosted glass has been used and a really good diffused light has been obtained with very even distribution of intensity and no appreciable glare.

An insulated steel mast, 475 ft. high and without any actual aerial wires, is supported on a concrete plinth and insulated from it by a group of porcelain insulators, which take the whole downthrust of the mast. The mast is kept vertical by three sets of stays spaced at 120 deg., each set consisting of two separate pairs of parallel stays attached to the mast at half its height and two-thirds of its height respectively. The mast aerial was supplied by the Radio Communication Co., Ltd. Each stay is insulated from earth by a large number of porcelain insulators inserted at various positions in the stay wire. Each insulator is equipped with a corona ring in order to prevent losses. The insulators upon which the mast rests are also equipped with corona rings. The base of the mast consists of a ball and socket joint so as to provide for movement produced by wind loading. Under ordinary conditions the movement has been reduced to the minimum by straining the stays to an initial tension of five tons.

The electrical characteristics of the mast can be varied by means of a vertical tube 75 ft. long situated at the top of the mast. The tube can be raised or lowered relative to the mast by means of a winch. Fixed to the top of the tube is a capacity ring 26 ft. in diameter. The advantage of this type of aerial is that it radiates the maximum possible amount of energy in a horizontal direction and reduces as far as possible the amount of energy radiated in other directions. The range for satisfactory programme reception without fading is thereby increased.

High-frequency chokes are interposed between the aerial and earth in order, as far as possible, to prevent damage due to lightning. The aerial tuning circuit and concentric feeder systems are, however, duplicated and the standby equipments can be immediately switched into service in the event of damage.

A large number of choke coils were supplied by Ferranti, Ltd., among them being two 5-henry, oil-immersed chokes each capable of carrying 35 A d.c. plus 5 A (r.m.s.) at 30 cycles, insulated for a working voltage of 20,000 d.c. These chokes are believed to be the largest in use by the B.B.C. The biggest has an iron core weighing one ton, and 8 cwt. of copper was used in the windings, while 230 gallons of oil was needed to fill the tank. Two 25-henry oil-immersed chokes were also supplied for carrying 2.5 A d.c. plus 1 A (r.m.s.) at 40 cycles, insulated for working at 20,000 V d.c. Two air-cooled choke coils having an inductance of 20 henrys when carrying 0.6 A d.c. are insulated for working at 5,500 V d.c.; they are over 6 ft. high and weigh 3¾ tons.

Iron-cored inductances were supplied by Johnson & Phillips, Ltd.; condensers by the Telegraph Condenser Co., Ltd., and British Insulated Cables, Ltd.; the alternator and motor-generators by the Electric Construction Co., Ltd.; the switchboards and motor-generators by the English Electric Co., Ltd.; storage-battery by Pritchett & Gold & E.P.S. Co., Ltd.; inter-communicating telephones by the Reliance Telephone Co., Ltd.; clocks by the Synchronome Co., Ltd.; cables and the wiring installation by the Sunderland Forge & Engineering Co., Ltd.; cables by W. T. Henley's Telegraph Works Co., Ltd.; meters by Ernest Turner Electrical Instruments, Ltd., and Weston Electrical Instrument Co., Ltd.; contactors by the Watford Electric & Mfg. Co., Ltd.; electric lighting fittings by Universal Metal and Neon Works, Ltd.; water meters by Electroflo Meters, Ltd.; and cranes by the Vaughan Crane Co., Ltd.

An Automatic Classifier

A TECHNICAL Press inspection last week of the modern plant installed at the Smallford, Herts, pits of the St. Albans Sand and Gravel Co., Ltd., for the handling, grading and washing of concrete aggregates afforded an opportunity of judging the capabilities of a "Sy-Vor" classifier which has been added to the plant for the separation of a large quantity of clay and other impurities from the fine sand aggregates.

This type of separator is made by the Key Engineering Co., Ltd., according to the syphonic-vortex patents of Mr. Leonard Andrews, M.I.E.E., who has specialised for many years in the design of plant variously arranged for the treatment of fine powders. It is used for a wide variety of purposes, including settling problems (which are analogous to classification) associated with chimney emissions from power stations. Plant of this sort has also been built by Messrs. W. Boby & Co., Ltd., for dealing with dust in suspension from furnaces, the resulting sludge being precipitated and automatically ejected in a thickened state which was convenient for removal.

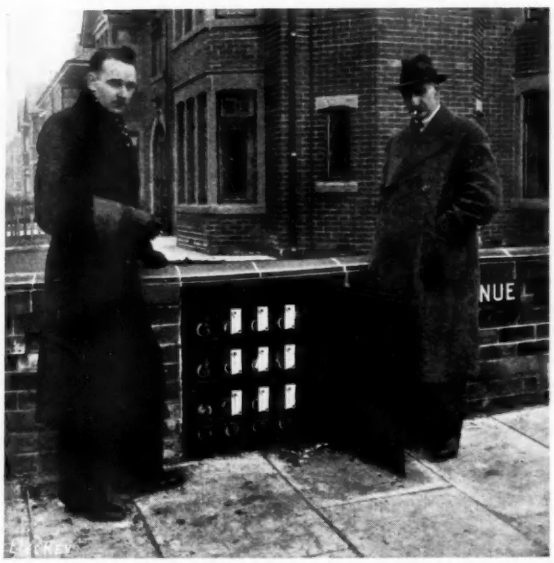
The "Sy-Vor" separator is entirely automatic in action. No mechanism whatever is used and there are no valves in the "solid" circuit. It consists of a conical tank arranged on a syphonic principle, gravity and momentum being the sole motive forces employed. The basic idea of this hydraulic separation is the maintenance of a correct relationship between the mass and size of the material to be removed and the velocity of the water in which it is carried, so that each individual particle is completely surrounded by water, thereby preventing mass capillary attraction. Diffused buoyancy is thus made to facilitate downward gravitation together with an upward vortex-induced separative classification.

Residential Distribution. By A. G. Cooper and H. Carpenter

Dwarf pillars and house-service disconnection

EIGHTEEN months ago, owing to the rapid development of the domestic load, in the area of over 3,000 acres served by the Thornton Cleveleys undertaking, where the property is chiefly residential, several additional disconnecting and fusing points were required in order to split up the forty miles of cables then laid. Thornton Cleveleys is known as the "Garden of the Fylde," and, in order not to spoil the natural beauties of the district, we tried underground disconnecting boxes in brick pits with manhole covers, but found them anything but handy in an emergency.

We wanted, if possible, to avoid using the usual type of street pillar on the grounds of appearance, obstruction on the footpaths and liability to damage by the skidding of vehicles. We first thought of designing a special box, similar to the underground disconnecting type, but so constructed as



Mr. A. G. Cooper, electrical engineer to the Thornton Cleveleys U.D.C. (right), and Mr. H. Carpenter, his chief assistant, standing beside a dwarf pillar in a garden wall

to be built in the palisade walls. We found, however, that we were able to use a cartridge fuse instead of links, as we did not, by our method of distribution, require more than 300 A for any one box.

Our distribution system is designed for each sub-station to supply an area of within one-sixth of a mile radius, which, with an allowance of 1 kW maximum simultaneous load per house will require, when the area is completely built up at an average density of twelve houses per acre, sub-station capacities of approximately 750 kW each. Feeders of 0.2 sq. in., duplicated where necessary, are run to various distribution pillars from which are fed 0.06 sq. in. ringed distributors, which serve from sixty to eighty houses.

A dwarf pillar with the door camouflaged to appear as part of the wall

As we do not care for rubber tails we designed a special tailless unit to carry the requisite current and, after experimenting and making several models, we asked Messrs. W. Lucy and Co., Ltd., to make up a complete pillar. We found then that it was not possible to use a larger cable than 0.1 sq. in., four-core. As the majority of units required would only be for 0.06 sq. in. distributors, we decided to standardise that size and run "straight through" to the feeder at the pillar base. This is far from being a disadvantage, as it is considerably easier to have the units jointed in the workshop than on the pillar site, thus reducing the jointing time at the pillar position, which is an important point if the pillar is being installed in an existing network necessitating the disconnection of the supply.

The dimensions of various pillars are as follows:—Depth, 10½ in.; height overall, 40 in.; and height above ground, 30 in. The width of frontage varies with the number of ways, being 20 in. for the three-way type and a further 5 in. for each additional way. We have found no difficulty with builders, and they have readily built them into the garden walls of new houses, where they can hardly be distinguished from their surroundings. When property is already tenanted, there have been no objections after the drawing up of a suitable agreement and the paying of a nominal easement.

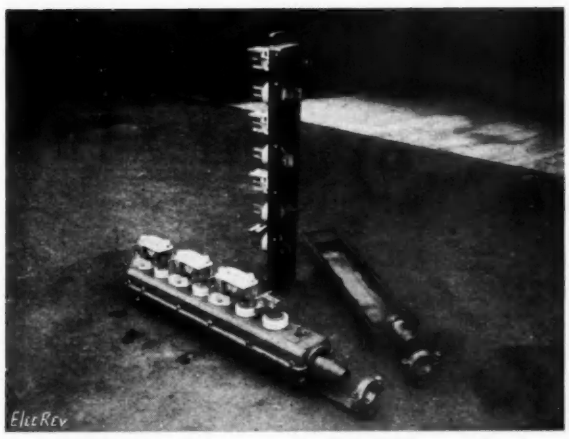
The coping tiles of the walls can very often be carried through; otherwise, a hard wooden block, shaped and painted to match, will suffice. In some cases the pillar has been painted brick red and the mortar lines have been carried through in grey paint. We have suggested to tenants that if they are displeased with the back of the pillar showing in their garden we will construct a small rockery or shrubbery to disguise it, but it has not yet been necessary to do this.

In one instance a hedge was trained to grow over a pillar which, after a few months, became very damp; this was cured by drilling top and bottom vent holes in the pillar shell. We believe that this type of pillar is not only less conspicuous than the standard street type, but it is also considerably easier to disconnect in emergency than the underground box. Its limitation to a maximum of 300 A carrying capacity makes it suitable for residential distribution only.

The development of the domestic load makes it increasingly necessary to reduce the possibilities of breakdown; to reduce the number of houses placed out of commission by one fault; and to restore supply quickly to all consumers.

Fused distribution pillars can be economically placed only to disconnect seventy to a hundred consumers, and some other form of disconnection must be provided. With new property this can be achieved on a large scale and at very little expense by the box illustrated. This is placed in every house in the street, or, if lead-covered loops can be run through the wall, in every other house. Disconnection is provided on all phases, so that no house need be off through a cable fault, as the house service which is connected on to the bus-bar studs can be fixed on either cable.

It is not practicable to designate the links in phase sequence as this complicates the jointing considerably owing to the necessity of twisting the cable cores in a very short length. We



Details of a dwarf pillar unit

have disregarded cable colours altogether, and have phased out each box from the last, painting the phase colours on every cable socket. The box is provided with a lock and interchangeable key, and is marked "Danger—400 Volts," thus complying with the Electricity Commissioners' Regulations, as it does not then become part of the consumers' service.

As the only other apparatus required in a house are a cut-out fuse and meter very little extra space is required, and this can very easily be obtained from the builder when its probable effect on continuity of supply is explained. The cut-out may be fixed on the box bracket or on the meter board.

As a ring distributor is required in order to obtain the full advantages of the system, only 0.06 sq. in. distributors have been necessary, and two of these can be easily handled and jointed before the floors are laid. A lead-cone gland and separate armour clamp are used to facilitate jointing, and the cable sockets are drilled for 0.1 sq. in. cable so that a 0.06

sq. in. sweating sleeve can be fixed on the cable ends to make an efficient mechanical or sweated joint as may be desired. Each sealing box can be removed separately so that additional jointing or breakdown does not affect the other cable.

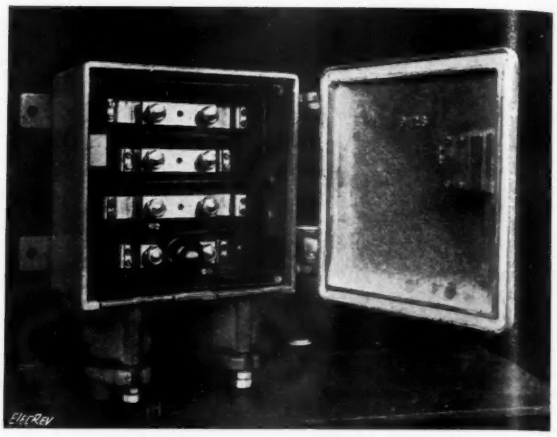
Phase separators have been provided, and live operation could be carried out on small loads with an insulated box-spanner, but is not necessary, because in a breakdown the section is disconnected at the distribution pillar and the quickest method is to disconnect in a house-service box about half-way along the distributor and to replace the sound portion, and so on, until the fault is found, transferring the house service at that point to the sound cable if necessary.

As there are no underground joints on this system and the major portion of the distribution cables is not laid in the public footpaths where excavations are frequent, the likelihood of cable breakdown is reduced to a minimum. Before the estate is completed disconnections may be necessary for additional jointing, but this would affect, at most, only one consumer.

The cables are all paper-insulated, steel-tape armoured and lead-covered, laid under the floors, two feet deep in the gardens and with a protective tile or conduit under paths. It may be argued that main cables should not be laid on private property, but this system requires no underground joints and probably less cable on private property than an ordinary service. As a consumer can be supplied from either end of the "ring," the main cables become a service to each particular house.

Another advantage is that the load on a heavily loaded phase could be easily transferred to the lightly loaded phase as and where required.

These boxes cost approximately £3 each, so that with the jointing and extra main cable required there is very little, if any, increase over the cost of an ordinary service. If made absolutely watertight and a pillar root placed to protect the cable entries, the boxes can be placed with advantage in house walls in various parts of the district to "split up" existing networks. The faulty section is then only small and can be easily disconnected and the supply quickly restored to a majority of consumers. It is the easiest and cheapest method of straight-through disconnection available, and could be economically placed to protect every 20/30 consumers.



The house service box employed at Thornton Cleveleys

Prepayment Meter Finance. By J. C. Woodville

How to deal with surpluses and shortages

DURING the past few years prepayment meters have become extremely popular, and it is safe to predict that as electricity becomes more readily available to consumers with limited incomes the use of this type of meter will increase still further. Ten years ago it was not unusual for the installation of prepayment meters to be discouraged, as it was then considered that the small consumer was of little consequence and hardly worth troubling about. The attitude of indifference to the minor user has now been abandoned throughout the country, and the small purchaser of electricity is becoming the focal point for future developments.

From time to time supply authorities have to decide, when a reduction in the price per kWh of electricity takes place, whether they will recalibrate the prepayment meters or whether they will allow consumers a refund when the money is collected by the inspector. In practice, it is rather expensive to have new gear wheels fitted to prepayment meters when the number to be recalibrated exceeds 5,000, and, also, this work of conversion takes a considerable time. Where the number of prepayment meters installed exceeds this figure some authorities prefer that the consumer should receive the price reduction in the form of a cash refund when the meter is emptied.

Cash Refunds Popular

Among the poorer classes of the community the system of cash refunds is popular and, furthermore, it puts the supply authorities on the same footing as the gas companies, which have made it a practice for many years to hand back to the consumer a portion of the money taken from the meter.

To enable the collectors to deal with the cash refunds as expeditiously as possible, a small card should be provided on which are printed the appropriate cash refunds from 1 to 100 kWh. It is admitted that cash refunds entail additional work for the meter collectors and perhaps additional clerical work in the office, but these disadvantages are more than compensated for by the advantages which accrue from the system.

It is now recognised that prepayment meters are a convenient medium for collecting amounts due for the hire of installations, standing charges, and the hire and hire-purchase of electrical apparatus. The number of assisted-wiring schemes inaugurated during the past few years is sufficiently indicative of how prepayment meters have helped to increase the business of supply authorities.

The percentage of prepayment defaulters is invariably relatively small, but, nevertheless, the supply authority must deal with them in a consistent manner and in accordance with statutory requirements. Monetary shortages may be due to (1) faulty meters, (2) the insertion of tokens instead of coins, and (3) the meter being forced by the consumer or by some unknown person. Section 21 of the Electric Lighting Act, 1882, provides as follows:—

> If any local authority, company or person neglect to pay any charge for electricity to the undertakers in respect of the supply of electricity to such local authority, company or person, the undertakers may cut off such supply and, for that purpose, may cut or disconnect any electric line or other work through which electricity may be supplied and may, until such charge or other sum, together with any expenses incurred by the undertakers in cutting off such supply of electricity as aforesaid, are fully paid (but no longer) disconnect the supply of electricity to such local authority, company or person.

The legal importance of this section of the Act is that the consumer must "neglect to pay" for his electricity before the supply authority can have power to disconnect the supply. In case (1), when the consumer has obtained more electricity than he has paid for, due to a faulty meter, there is obviously no neglect to pay on the part of the consumer and the supply authority is under the obligation to ascertain the sum due from the consumer and, having arrived at this figure, must render an account for this amount. Only when the consumer refuses to pay does the power of disconnection become operative. When (2) tokens have been inserted in place of shillings, sixpences, or pennies, the authority has the power to disconnect the supply immediately the meter collector discovers the tokens, as supply through a prepayment meter implies payment in advance, and here the consumer has clearly obtained electricity without payment.

In case (3), when the meter has been broken open and the money abstracted by the consumer, or by a person who is not a consumer, the power to disconnect under Section 21 should not be confused with the other remedies to which the supply authority may have recourse. The principle, however, is the same as in (1), *i.e.*, that when the consumer inserted the coin there was no neglect to pay. In consequence, a demand must first be made for the shortage before the authority considers the advisability of disconnecting the supply.

When the coins have been abstracted by an unknown person the consumer is generally liable for the safe custody of the moneys, but it should be borne in mind that immediately the coins are placed in the meter they become the property of the authority, and any proceedings taken for unlawful interference must be against the person who interferes, and not against the authority's consumer.

The prepayment consumer has become an important source of revenue, and special attention will have to be given to his needs and requirements. In a number of instances supply authorities will have to abandon preconceived ideas and prejudices if they are to gain the full benefits which are latent in this class of consumer.

Earthing in Mines.

By T. C. Gilbert, A.M.I.E.E.

Protection against leakage currents

THE annual reports of the Electrical Inspector of Mines during the past ten years show beyond doubt that the most important single cause of electrical accidents in mines is inadequate protection against leakage. Fatal shocks have often been received from electrical apparatus earthed in accordance with all generally accepted requirements, indicating that present methods are almost completely ineffective in preventing such occurrences.

Two such instances are mentioned in the Inspector's report for 1933, and he states that "earthing, as it is generally understood and applied, is not a complete safeguard against a dangerous shock from earthed metal casings." He discusses this problem in two appendices, D and F, but no definite conclusions are reached and no recommendations made for future guidance. Apparently the old inadequate method of solid earthing is still considered to be the only practical form of leakage protection.

Resistance of Earth Conductors

One fundamental difference exists between the earthing problem in mines and that of the ordinary installation, namely, that the final earth connection of mines is necessarily remote from the apparatus, being made above ground. It is clear from the reports that such earth connections are usually beyond reproach, but it has not been found practicable to reduce the resistance of the necessarily long earth conductor below the few ohms sufficient to prevent high leakage potentials, taking into account the heavy leakage currents involved. For instance, in the case of the Mossheath colliery fatalities, we read: "Tests were made of the conductivity of the earthing conductor with the following result: Resistance of the two cores of the cable, 2.549 ohms; resistance of the cable armour, 5.24 ohms; and relative conductance of cable armour with respect to core, 25 per cent. After giving further attention to the joints and bonds of the cable armour, the resistance was reduced to 4.70 ohms, which, however, gives a relative conductance of only 27½ per cent. as compared with a minimum of 50 per cent. that is required by regulation 125 (b)."

Again, at North Seaton, a fatality was caused by a haulage rope becoming alive, and "the resistance of the earthing conductor, as tested between the machine and the gate-road switch, was in the region of 30 ohms, this high resistance being due to one or more of the earthing contacts in the plug boxes." These two examples are quoted from many similar ones to indicate that high earthing resistance is to be anticipated under mining conditions, especially where cable armour and plug contacts are relied upon to furnish the earthing conductor. In the latter case, the inspector commented upon the apparent lack of any systematic testing of the earth circuit, a failing that is general.

The problem thus seems to be incapable of solution by ordinary solid-earthing methods, as the earthing conductor, even if of copper, must possess some appreciable resistance; the heavy currents necessary to effect isolation by means of the overload devices installed in connection with the comparatively large motors utilised must give rise to high leakage potentials. In some cases instantaneous leakage trips are installed, set to operate with varying values from 5 to 100 per cent. full-load current, depending upon other factors connected with core-balance protection. Such leakage trips are necessarily high-current devices (and must not be confused with the low-current apparatus to be dealt with later) but even with such trips as are used at present selectivity of operation is almost impossible to obtain, as is shown in appendix F.

Suggested Remedies

After discussing possible palliatives, the inspector says: "It has been suggested that the potential rise upon the casings of electrical apparatus could be prevented, or considerably reduced, by local earthing, to supplement the earthing conductor that is required to be provided by the terms of General Regulation 125, but it would be difficult . . . to make a satisfactory local earth connection."

The general meaning of the words "satisfactory earth connection" is, presumably, "low-resistance and heavy current-carrying capacity earth connection," and this would appear to be one reason why earth connections are required to be at the surface of the mine and not underground. At the same time, if a protective system could be applied that would operate unfailingly in the prevention of dangerous potential upon connected casings with an earth connection of high resistance and of such general inferiority that it would not be permissible under *present* practice, then I assume that there could be no objection to the provision of such local earth connections. With the low-current leakage protective devices now being installed in above-ground situations with difficult earthing conditions, high earthing resistances are immaterial, as the small operating currents, ranging from 20 to 30 mA, render the devices independent of a good earth connection.

I would suggest that the same principles could be effectively applied to mining conditions, and should go far towards providing adequate earth-leakage protection. A local earth connection near a gate-end switch, consisting, say, of an iron spike and length of lightly insulated copper conductor, would adequately protect the coal-cutting machine controlled thereby, even if the resistance of this earth measured from 500 to 1,000 ohms. I am not suggesting that the large permanent earth conductor required by the mining regulations should be discarded, but that the leakage trip should be connected between this main earth conductor and the local earthing spike. Not only would this arrangement prevent the appearance of a leakage potential in excess of a pre-determined level upon the earthed casing and the earthing conductor, but it could be immediately and easily tested.

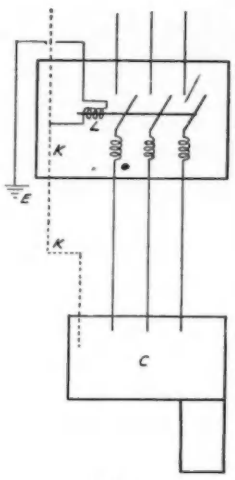


Fig. 1

Such an arrangement is shown in fig. 1, in which C is the coal-cutter or other machine connected to the gate-end switch; K is the permanent earth conductor, and the trip L is connected between this and the local earth E. With a trip coil having an impedance of about 500 ohms at 50 cycles and requiring 30 mA for operation, leakage potentials upon K can be limited to about 30 V even with a resistance of 500 ohms at the local earth spike at E. The conditions below ground are such, however, that much lower resistances than this should be common, say, from 50 to 100 ohms, a usual value for this form of electrode above ground, with a corresponding reduction in potential before operation. In any case, it will require only 10 A in the probably 3-ohm earth conductor to provide this 30 V, in the remote possibility of the earth connection being as high as 500 ohms.

Supplementary Safeguarding

Low-current leakage protection can, therefore, be made completely supplementary to all existing forms of safeguarding, and even the present leakage trips (so-called, although they are essentially high-current devices) may be retained. This means that no existing equipment need be scrapped, the low-current device being fitted as an extra trip near the gate-end switch, for instance. It can be a very simple device consisting of leakage trip and contacts, because as it does not operate under overload no special blow-out or other accessories are called for. The usual push-button test key should be incorporated.

Investigation of mining electrical accidents, according to the reports, has shown again and again that inspection and tests of the earth circuits have been neglected. It is difficult to see what value under practical conditions the simple resistance test can be as, apart from the difficulty and inconvenience of making such tests, the low resistance necessary to ensure safety cannot be secured. From the newspaper reports of the inquest following the recent North Gawber disaster it would appear that certain tests and examinations were ineffectual. The inspector is stated to have said that testing instruments were in use in about ten per cent. of the South Yorkshire collieries, but it is not clear if this remark refers to electrical or other testing equipment. In any case, however, practical men know that, for various reasons, routine tests of earth circuits are not regularly and effectively carried out, and it would seem necessary that where men's lives depend upon such circuits being sound tests should be automatic, or at least of extreme simplicity.

I have always contended that a resistance test only of an earth conductor is almost useless; an equal requirement is heavy current-carrying capacity, depending upon operating conditions. A useful test current would be 2½ times normal full-load current, as this would be its approximate loading under fault, but such a test is too difficult of application, apart from damage likely to accrue during the test. As matters stand, therefore, the first indication of an inefficient earth circuit is the occurrence of an accident, especially under mining conditions.

Low-current protection, on the other hand, permits all necessary tests to be easy, simple, and in some cases automatic. A

suggestion is given in fig. 2 whereby the normal, or an extra, stop button of the coal-cutter controller is made to test the earth circuit between the cutter and the nearest electrode, the switch being tripped by passing a small artificial fault current through the trip coil. In such a case, the earth conductor between the cutter and the switch would require to be lightly insulated, but as it is common practice to utilise tough-rubber trailing cables with an embedded earth conductor this condition is easily met. Contact is made to one phase through the high resistance R, and this protection is also supplementary; it can be applied at every switch, and through the progressive stages shown in fig. 3. Every necessary test can be made by means of push-buttons.

Fig. 2

Selective Arrangements

In Appendix F of the 1933 report the inspector discusses the possibility of grading leakage protection with a view to achieving selectivity, but without apparently reaching any useful conclusion, as he states on page 84 that "unless there is considerable resistance in the cables, or in the fault itself, selectivity is not obtained with the trip settings postulated"; and again on page 85 that "the only gain in selectivity is in preventing the tripping of the shaft feeder switch except for a fault in the shaft cable." Here, too, low-current protection can provide perfect selectivity if local earth connections could be utilised in place of the present heavy continuous earth conductor carried up to the surface of the ground. This, however, would entail departure from long-established practice, but the suggestion may nevertheless be of interest in view of the importance of the problem.

If the principle of low-current protection with local earth connections only, as opposed to the previous application utilising existing heavy earth conductors in addition, is accepted as practicable and suitable for mining conditions, selective arrangements could be made as shown in fig. 3, where the appliance, the gate-end switch, district switch, pit-bottom switch and shaft feeder switch has each its own local earth connection. The continuity of the cable sheathing or earth conductor would require to be interrupted at each successive device, with the result that only the circuit affected would be isolated by leakage fault. For instance, with a fault on the coal-cutter or its trailing cable, the gate-end switch would be opened; on the gate-end switch and the cable up to the district switch, the latter would be opened; on the district switch and the cable up to the pit-bottom switch, the latter would operate, and so on. At present, it seems possible for heavily laden vehicles to run over and damage trailing cables without immediate isolation, but with immediate fatalities, and some more sensitive and certain form of leakage protection appears to be necessary.

With the arrangement suggested above, almost as valuable as the elimination of heavy fault currents from the mine and the rendering unnecessary of expensive low-resistance earth circuits is the ease with which all earth circuits can be tested by push-buttons. Probably many arrangements of a superior character will at once occur to the practical mining engineer, but these notes are only concerned with the suggested adoption of the principles of low-current protection.

Dangers of Heavy Fault Currents

In addition to its possibilities in causing overheating and fire in pits, the heavy fault current gives rise to other difficulties of an unusual kind. Several cases of death from electric shock are detailed in the mines report for which no explanation was forthcoming, there being no apparent defect in equipment or appliances anywhere in the immediate district. My opinion is that such accidents were caused by the appearance of potential gradients at the points where the accidents occurred, these being set up by heavy earth currents originating at some distant point, the resistance of the earth circuits preventing isolation. In support of this view there are many cases on record (mainly abroad, but at least one in this country) where animals have been killed by such gradients set up by leakage at points up to half a mile away. Such accidents are rare in above-ground installations, except in rural areas where earthing conditions are difficult, because in towns there is usually such a mass of underground water pipes and cable networks that earth currents are more or less directed in their path by these metal circuits and rarely appear upon the surface of the ground. In the rural area, and the mine, buried pipes, &c., do not exist, and the probability is that earth currents must appear on the working surfaces at some time or another, with the unfortunate results shown.

In case No. 9, Riddochhill Colliery, a lad was found dead from established electrical causes, but no defect could be found in near-by electrical equipment; there was, however, a gate-end switch-box on the floor some ten feet away, and with the present system of continuous earth conductors it would be possible for a dangerous potential to have been extended to this point from some remote defective equipment, the resulting current setting up a possibly momentary potential gradient in the surrounding area. The probability is that the current flow was of long duration, as the existence of many small burns upon the deceased's body indicated; it was established that the burns took place after death, which was due to shock, and current must have appeared where the lad lay.

With a localised system of leakage protection, as shown in fig. 3, such extension of leakage potential is not possible, and the small currents employed for isolation would not be capable of setting up voltage gradients of measurable magnitude.

Many systems of electricity supply to mines insulate the neutral point, but the low-current method of protection can be applied equally well to these as to the system with an earthed neutral. There is always sufficient distributed leakage from the three phases to afford a path for the 30 mA necessary to isolate a leakage fault at any point, and this is borne out by the inspector's statement on page 40 of the 1933 report: "The neutral point of the three-phase system was insulated, but the electrostatic capacity of the system to earth sufficed to pass sufficient current through the bodies of the men to produce the physiological results described." Luckily, this particular incident had no fatal results, though the supply was at high voltage, conditions preventing a fatal current.

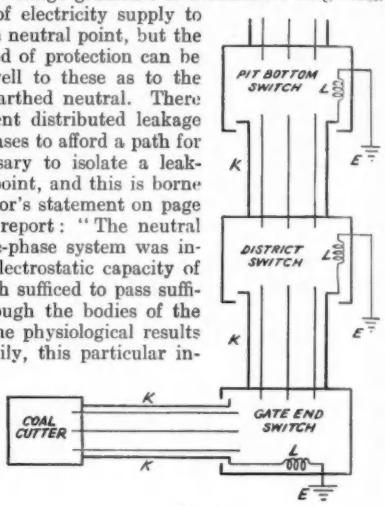


Fig. 3

One further advantage with low-current leakage protection as indicated in fig. 3 would be that faults, whether in equipment or cables, would be detected before reaching the dangerous stage, enabling repair or replacement to be effected. At present, all faults must reach the overload stage before they can be isolated, and the consequent dangers from fire and shock have been detailed in the reports quoted. Above ground they cannot cause such high loss of life as is possible in the mine, and it would appear that low-current protection, now coming into its own in the ordinary installation, is even more necessary underground.

Mr. Herbert Smith, of the Yorkshire Miners' Association, at the inquest following the North Gawber explosion, admitted that he was prejudiced against the use of electricity in mines, but even the electrical inspector did not appear sanguine as to the possibility of securing safety in the particular mine concerned, although it was not suggested at the inquest that electricity was directly responsible for the explosion. There is, too, a paragraph in the 1933 report, page 31: "Following this accident the use of electricity was abandoned, but if electrical power is to be withdrawn from every wet pit, the economic situation would indeed be serious." The only abandonment that need be made is that of heavy-current leakage protection, over-reliance on which has been, from the evidence of the reports, directly responsible for a very large proportion of the electrical accidents recorded, and which, in the opinion of the engineers concerned, is incapable of affording the requisite degree of protection.

Polyglot Propaganda

The *Electrical World* says:—"Imparting a personality to electric service is a tough job at best, but consider the problem faced by the Consolidated Gas system in the New York area, where it can't be done in a single language or even in two or three tongues. Largely by use of the radio, these companies are attempting to bring about a better understanding of their aims and operations among 1,750,000 Jews, 440,000 Italians, 238,000 Germans, 238,000 Poles, 28,000 Greeks, 57,000 Spaniards and 60,000 Hungarians. The times selected for the broadcasts were arrived at after a study of the habits of the racial groups; some run for five minutes and others for as much as three-quarters of an hour. Outstanding representatives of various groups are to make talks; two Italian housewives converse over the excellence of the electric iron; some of the programs are largely musical, and most of them feature, in name or subject, some familiar echo of the listeners' native land."

An Electrified Week-end Cottage

THE Old Mill Cottage at Broughton, in Hampshire, to which the following notes refer, is not a pseudo-ancient building that has been carefully planned to accommodate all types of modern electrical appliances. It is really old, having been built some three hundred years ago, and has a great thick thatch. It stands on an island surrounded by the mill stream of the River Wallop and its backwater, between sixty and seventy miles from London. Because of its electrical equipment it is always ready for instant occupation.

Electricity has been introduced to this quaint old cottage without spoiling its charm. The Wessex Electricity Co. provides a supply to the village of Broughton by an overhead system and it is doubtful whether anyone notices the poles upon which the wires are carried. It is certain that the many visitors would not be able to describe how the lines are brought to the cottage. From a pole in the road there is a line to another one in the orchard, where the great apple trees almost completely hide it. An attachment to the chimney and a lead to the back porch brings in the service. The main switches, fuses and meters are neatly arranged in the back porch. The same company carried out the interior wiring in such a way that it can hardly be seen.

Every Modern Convenience

In the sitting-room there are four plugs, three for lighting and one for power. Two of the lighting plugs are generally used for portable lamps and the third is available for a wireless set or any other electrical appliance. The power plug is mainly used for a radiator and from time to time for the vacuum cleaner.

A lantern outside the front door lights the whole length of the bridge between the mainland and the island. In the porch is a lamp and also a plug, primarily for a wireless set.

The dining-room has a ceiling lamp between two oak beams immediately above a gate-legged table. The four lighting plugs are used for a multitude of purposes, in addition to portable lamps. There is a hot-plate for keeping food warm, a toaster, a kettle and a mains clock on the mantelshelf. The power plug is used for either the radiator or vacuum cleaner, as in the sitting-room.

In the kitchen there are two enclosed ceiling fittings fixed horizontally, one on each side of an oak beam, and there is one lighting plug for an electric iron. To the two power plugs are connected a Belling cooker with a loading of 5050 W, and a B.T.H. "Liftop" refrigerator. Two-way switches are a great convenience on the quaint old winding staircase in the back passage. The bathroom, which is a real luxury in this cottage, has, in addition to a ceiling light, a useful mirror light.

In a small shed behind the bathroom there is a hot-water tank, and above it is the cold water supply tank. The ¼-h.p. Broadwell automatic pumping set lifts the water silently and without trouble at the rate of approximately 160 g.p.h. from a well a few feet away. The hot-water tank is lagged and is heated by thermostatically controlled immersion heaters.

Upstairs, a two-way lighting plug in each of the two bedrooms supplies portable lamps from one side and an electric bed pad or hair-dryer from the other. A power plug on the landing is used for heating either of the rooms or for a vacuum cleaner.

In addition, an outhouse is lighted by electricity and has also a power plug for a trickle-charger or for washing apparatus.

The Old Mill Cottage at Broughton

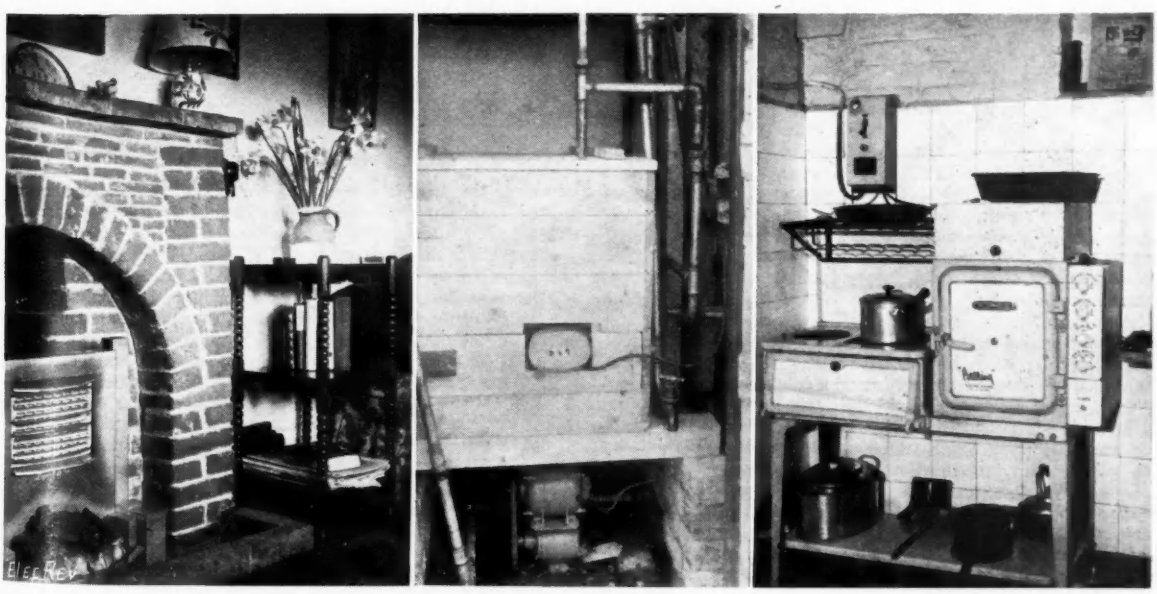
Thus, in a very old cottage can be found the most modern electrical appliances for the benefit and most certainly for the health of its occupants. The Wessex Electricity Co. provides the supply at standard voltage on a two-part tariff. The fixed quarterly charge is 11s. 11d. and the secondary charge for lighting, pumping, heating and cooking is 1¼ per kWh, and for water heating ¾d. per kWh. During a winter quarter, for constant operation, approximately 400 kWh is taken at the higher rate, and 1,000 kWh at the lower.

Ready for Occupation

With a minimum of effort the maximum of rest and recreation can be obtained from either a short or long visit at a price which cannot be said to be in any way unreasonable. For a week-end visit a warm atmosphere, boiling water and a heated oven are available almost as soon as it is possible to get one's bags unpacked, while hot baths for several persons will be ready in from two to three hours after arrival.

The whole of this is carried out without the bother of stoking up a boiler or lighting fires, or filling smelly oil lamps, or even in getting ready an oil cooking stove and generally getting somewhat grimy and tired before it is possible to begin to enjoy a week-end visit. This applies equally to a longer visit, and experience has shown how much the ease and comfort with which all these electrical appliances are handled contribute to the general happiness of everyone concerned.

The cottage is the property of Mr. and Mrs. Ernest Leete. Mr. Leete, as many of our readers are no doubt aware, is managing director of the London Electric Wire Co. & Smiths, Ltd.



Some of the electrical apparatus:—Left: A converted fireplace. Centre: Motor for pumping water from the well. Right: Kitchen equipment

The "Queen Mary." (FROM OUR SPECIAL CORRESPONDENT)

Preliminary particulars of the equipment

ELECTRICAL power and light on the *Queen Mary* are derived from two generating stations, one of which serves the auxiliary machinery in connection with the propelling plant, and the second the hotel services and deck machinery.

The former is situated between boiler rooms Nos. 4 and 5 and contains four 1,300-kW turbo-generators. Steam for the turbines is taken from the h.p. system supplied by the main w.t. boilers at 400 lb. per sq. in. and 700 deg. F. The 5,000-r.p.m. turbines are coupled through single-reduction gearing to 220-V d.c. generators running at 600 r.p.m.

The compartment containing the machines and main switchboard is 30 ft. long, 65 ft. wide, and 33 ft. high. The main switchboard is erected on a platform above the machines and is about 40 ft. long. Power is carried by means of ninety-six 1.0 sq. in. cables to a distribution ring main (arranged on "F" deck), which is fed at two points.

Auxiliary switchboards are fitted in each watertight compartment. All the auxiliary machinery in connection with the propelling turbines, except the turbo-driven feed pumps, is electrically driven, and, in addition, the load includes electrical selective salinometers, indicators, telltales, pyrometers, telegraphs, two motor-driven air compressors for boiler cleaning, an engineers' workshop equipped with engine lathes, radial drill, high speed drill, and emery grinder; sixteen fan units to supply air for combustion to the boilers; and the lighting installation. One generator will generally be spare, but all four can be run together.

The generating station supplying the hotel services and deck machinery is an independently operated unit, situated in a compartment 30 ft. long, 55 ft. wide and 33 ft. high between boiler rooms Nos. 2 and 3. It contains three turbo-generators of the same capacity as the other station, but steam is obtained from three Scotch boilers in No. 1 boiler room at 250 lb. per sq. in. and 220 deg. F. superheat.

The main switchboard, about 35 ft. long, is erected on a platform above the machines as in the auxiliary station. From this board two sets of twenty-eight 1.0 sq. in. cables carry the power to a ring main (on "B" deck), which is fed on both port and starboard sides. The ring main extends round three-quarters of the length of the ship and is tapped at appropriate points to supply power to auxiliary switchboards.

Many Kinds of Apparatus

All the cooking ranges, hot presses, ovens, &c., in the kitchens are electrically heated, and in addition the following equipment is provided: Electrically heated fryers, one with two and one with four pans, waffle irons, griddle plates, electric salamanders, and apparatus for mixing, coffee grinding, ice shaving, burnishing ranges and silver, toasting, making coffee, boiling eggs, peeling potatoes, dish-washing, cutting, orange juice extraction, mixing dough, dividing dough and making rolls, making ice-cream, ice-breaking, ice-cubing, knife-cleaning, &c. The following list (which is not exhaustive) gives some idea of the extremely varied nature of the load on the machines:—Ventilating system and fans, passenger, goods and service lifts, dumb waiters, fireplaces, illuminated signs, clocks, steward-call system, sound-moving picture equipment, automatic manual fire-alarm system, hairdressers' equipment, refrigeration plant, hot and cold fresh-water systems (ten pumps) and hot and cold salt-sanitary systems (four pumps).

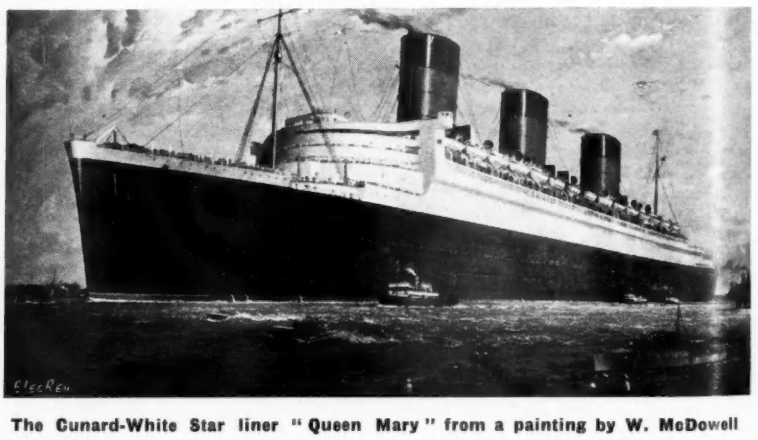
In both power stations each turbine is provided with a separate condenser incorporated in the design of the set, and thus, with independent vacuum, maintaining pumps, ejectors and lubricating systems, each generator forms an independent unit.

A rotary convertor delivers current at 25 V for operating the stateroom call bells and indicators, loudspeaking and intercommunication telephones, submerged log, fire alarm bells, electric clocks, &c. A secondary cell installation is held charged in reserve and will come automatically into action should the convertor break down.

Both power stations, although normally working independently, can be interconnected, so that, if one station fails, the other can carry on its functions to a limited extent. There are, altogether, 520 electric motors, ranging from ¼ to 300 h.p., one firm alone having supplied some 20,000 h.p. Over 30,000 lamps are fitted for lighting and decoration, and the cables extend to approximately 325 miles. Emergency generating plant is installed in a compartment on "C" deck as a standby to meet the requirements of the Board of Trade. Two 15-kW petrol-paraffin engine sets can be started and switched on to the emergency lighting system in less than five minutes. The whole installation more than fully meets the regulations of the I.E.E., the requirements of Lloyd's Register of Shipping and the Board of Trade.

Two radio stations, 250 ft. apart, allow of simultaneous transmission and reception without mutual interference. The transmitting station, situated just forward of the mainmast on the boat deck, contains four large transmitters, each of which can maintain continuous communication with both sides of the Atlantic throughout the voyage. The receiving station, where the control gear of the whole radio equipment is fitted, is situated on the same deck between the first and second funnels in a structure which contains eight operating positions, the radio-telephone exchange and the chief accepting office for passengers' radio telegrams. Each of the telegraphists on duty can, by operating a dial in front of him, start or shut down a transmitter, increase or decrease its power or change the wave-length. Thirty-two wave-lengths are available, eleven for short waves, nine for radio-telephony, seven for long waves and five for medium lengths.

The aerial system comprises a main aerial of 600-ft. span, an auxiliary aerial of 150-ft. span, three short-wave aerials, five receiving aerials and an emergency aerial. Continuous attention will be given on the 600-metre wave as required by the Board of Trade under the International Convention for the Safety of Life at Sea. Simultaneous operation of two subscribers' service radio telephones is afforded—one passenger may be speaking to America while another may be speaking to Europe. Booths are established in various parts of the ship including each of the 500 staterooms. With the co-operation of the British G.P.O. and the T. and T. Corporation of New York, secrecy devices have been installed to prevent overhearing or interference either on board ship or ashore.



The Cunard-White Star liner "Queen Mary" from a painting by W. McDowell

Provision has been made for the simultaneous relaying of three different broadcast programmes to the public rooms. There are thirty-eight loud-speakers arranged in eight groups, each group being supplied by a separate line from the amplifier on the output control panel. This panel has a selector switch for each line to enable the operator to connect either of the amplifier outputs to any of the loud speaker groups, while on the input side either of the amplifiers can be connected to any one of the four microphone lines, to the gramophone pick-ups, or to the input from a broadcast radio receiver.

Orchestral music can be relayed from the cabin-class lounge to the tourist and third-class garden lounges. At the same time dance music can be provided from gramophone records to passengers in the cabin-class ballroom, the verandah grill and the "A" deck tourist lounge. The microphones can be connected *via* amplifiers to the ship's radio-telephone transmitter so that a concert or speech on board ship can be received and re-broadcast by the B.B.C. or other similar organisation in America or elsewhere. When in port any function on board can be broadcast through the medium of land lines, which are also available for establishing direct telephone communication between the ship's system and the shore organisation.

The portable loud speaker cases are designed to match the scheme of decoration and furnishing, while the fixed speakers are built into, and tone with, the decoration of the rooms. Controls are provided to enable the volumes to be adjusted. This, together with the alternative programme facilities, will ensure that the varying tastes and requirements of the passengers in regard to entertainment or news will be met in every way.

Planning Showrooms. By R. D. Reynolds

Some observations and suggestions

IN planning electricity showrooms it is important that the electrical men concerned shall first crystallise their ideas on the subject so that they can lay down the requirements before other interested persons, especially the architect, commence to produce their schemes. This is a golden opportunity for us to demonstrate that structural work must be designed to fit the modern requirements of electricity, and we ought to take full advantage of it.

The question of housing the administrative offices, workshops, stores, &c., in one building will almost inevitably arise, and may tend to overshadow the vital need, so far as the showroom is concerned, of being situated in one of the most prominent positions in the shopping centre. If it is humanly possible, a first-class site should be secured, even though this may preclude the possibility of housing other departments under the one roof.

It is as well not to follow existing designs too closely, as new ideas are constantly evolving in the structural and electrical spheres. At the same time, it should be borne in mind that certain showroom features have proved to be sound practice as, for instance, provision for the payment of accounts at the end of the main showroom. In addition to providing suitable space for water heating equipment, radiators, washing machines, vacuum cleaners and the remainder of the well-known apparatus, the provision of a demonstration room or theatre is also recognised as a necessity. This should, if possible, be situated on the ground floor.

A Miniature Stage

The platform in the demonstration room of large showroom premises may, with advantage, be designed as a miniature stage complete with cinema screen, curtains and colour-lighting equipment. When required for demonstrations other than cooking a curtain may be used to conceal the normal kitchen equipment. The uses of a demonstration theatre of this type are many, and full opportunity presents itself for the incorporation of architectural lighting. Indeed, this form of illumination should be used almost exclusively for the permanent lighting of the showroom premises. It should, of course, be possible to demonstrate every other system of lighting, and, when space permits, there should be a separate lighting display section where a full range of fittings can be exhibited. A miniature lighting service bureau may also be incorporated so that the need for adequate and proper lighting can be demonstrated in an effective way. Model rooms, in addition to their value in showing the way in which the home should be electrically equipped, can prove very useful by aiding the consumer in the choice of fittings. It should be possible to change any fitting in the room by a few simple movements.

Industrial and Agricultural Displays

If the nature of a district warrants it, the provision of an industrial section showing a few typical electric drives and portable electric tools should prove invaluable. The prospective power user can be invited to experience the simplicity of starting and stopping electric drives. He can also be shown, under practical working conditions, the advantage of good lighting.

In some districts it may be desired to include a section devoted to equipment for poultry farming, market gardening, and horticulture, and the roof, if flat, is a good place for this. The equipment should include a greenhouse with intensive lighting and thermostatically controlled electric heating, a garden frame with soil-heating cable, an electrically lighted laying shed for poultry, electrically heated brooders, &c. Inexpensive cover can be constructed for apparatus requiring protection from the weather so that incubators and the electrical drives of dairy and farm equipment and machinery can be demonstrated. Keen members of the staff may desire to carry out experiments to determine the difference between plant growth with and without soil heating and under conditions of intensive lighting. Practical knowledge of this subject will enable them to speak with greater authority and conviction.

In regard to the main showroom, care should be taken to avoid giving it a hotel lounge effect, or making it so palatial that the poor person will feel out of place. The artisan class, I am convinced, likes to see goods in the mass. Ordinary shopkeepers generally understand the psychology of their customers, and in the poorer districts we find that they do not provide showrooms or shops with "wide open spaces." The style of display should be chosen to suit the district.

Where it is found that the mass display of shades, kettles, radiators, irons and other apparatus attracts more business than the display of single articles, the stocking of goods of the cheaper varieties must be considered. Here we come to the thorny question of whether we are to come down to the level of the cheap stores and sell cheap goods. Most electrical men will be against this. At the same time we often remark that the majority of electrical apparatus is too dear. It is useless condemning an electrical appliance because it is cheap. The design of some of the more expensive apparatus is poor, and it is often no more sound electrically than some of the cheaper goods. For instance, upon conducting a detailed examination I have found a bowl fire selling at 10s. 6d. to be less sound electrically than one retailed at 5s. by a cheap stores. Of course, much cheap apparatus is rubbish. We in the electrical industry are, however, in the happy position of being able to discriminate; if we do so we can offer sound and reasonably cheap apparatus and so put ourselves in a better position to draw the public away from the cheap stores into our premises. I think that we ought to make a prominent display in our showrooms of such small supplies as flex, lampholders and fuse wire, which interest the handy man. When a customer buys, say, a small quantity of flex we can make discreet inquiries as to how he proposes to use it, and offer sound advice which he will not get at a multiple stores. It is, of course, assumed that definite sales of apparatus will be made from the showroom, and that if a policy of working through local contractors is to be followed an arrangement will be made whereby goods are delivered or taken direct from the showroom.

Mr. R. D. Reynolds, A.M.I.E.E., is area officer of the Electrical Development Association for South-East England

If there is no space on the premises for workshops for reconditioning cookers and other large apparatus we ought to find room for a small appliances repair shop so that any faulty goods brought in can be quickly repaired and handed back to the consumer.

A Novel Idea

It occurs to me that it might be a good plan to invite any woman to make cakes or to cook a complete dinner at the showroom and to allow other members of the family to dine there. A kitchenette and a small dining room, or a smart little kitchen with dining alcove could be provided. Cooking operations would, of course, be carried out under the guidance of a demonstrator.

For heating the premises nothing but electricity can be thought of, and if we embody every method, such as storage, tubular and panel heating, the staff will gain valuable experience of the different systems, and what is also most important, they can be demonstrated to consumers in actual use.

As regard the windows, some people are inclined to favour the "vista" type. In general, these are not well suited to the electrical showroom. Displays of electrical apparatus usually require a background, and the windows should be designed with this end in view. Sometimes, if the layout favours it, one vista window can be used with good effect. If possible, windows should be so arranged that the public can examine them under cover. Incidentally, the window lighting installation, with its provision for the use of colour, should be beyond reproach.

The elevation of the building should be designed in the modern style in material of light colour, its masses and contours being specially arranged for beauty of effect when floodlighted, while the facia or other illuminated signs must set an example to all shopkeepers in the district.

It is conceivable, in an old world town, that it may be necessary to conform with the period style, nevertheless, the requirements of floodlighting should be borne in mind. Happily, floodlighting has an æsthetic as well as a commercial value.

Standard Miners' Lamp Bulbs

The British Standards Institution has issued a revision of British Standard Specification No. 535 for miners' lamp bulbs. Four bulbs are now included, namely, one cap-lamp bulb rated at 2 V, 1 A, and three hand-lamp bulbs rated at 2.5 V, 1.5 A; 4 V, 0.75 A; and 4 V, 1 A. Copies of this specification may be obtained from the Publications Department, British Standards Institution, 28, Victoria Street, London, S.W.1, price 2s. 2d. post free.

E.D.A. in 1935

Annual report, meeting and luncheon

THE annual luncheon of the British Electrical Development Association was held on Friday last week at the Savoy Hotel, London, and the annual meeting followed in the afternoon. Viscount Falmouth presided at the luncheon. The Association toast was proposed by SIR HARRY BRITTAIN, who said he spoke as a typical citizen whom the electrical industry served, and referred to the great changes that are taking place in our national life, notably, the improvement of roads, the amazing increase in the number of factories, the spread of the vast web of industry around London and Greater London, wireless, the grid, and the improvement in railway services. The recent decision of the L.N.E.R. to embark on the electrification of the Penistone route between Manchester and Sheffield, a very densely trafficked section, marked an epoch in the history of railway electrification here; it was a goods traffic scheme. The speaker touched upon the rapid increase in blocks of flats with electrical facilities.

Sir Harry believed that the electrical industry as a whole was a little timid and backward in giving the public a lead in visualising the great future of electricity—the most vital agent of modern life. There would be a great opportunity of demonstrating this in the electrical exhibition which he understood was in course of arrangement for 1938. It was a mistake to talk of electricity as something new. (The ELECTRICAL REVIEW was founded sixty-four years ago!) Entrenched prejudices and entrenched interests were standing in the way of its utilisation.

Electricity is Cheap

There was a general impression here that the price of electricity everywhere was prohibitive, but the results of an exhaustive inquiry by E.D.A. recently concerning the cost of electricity for domestic services other than lighting, covering 11,000,000 homes of which more than 6,000,000 were supplied with electricity, showed that only five per cent. need pay more than 1d. per kWh. We were leading the world in the development of basic household uses; last year over 200,000 electric cookers were installed.

Turning to the subject of advertising electricity, Sir Harry Brittain remarked that, while E.D.A. had done all it could with the funds at its disposal, there was still an immense amount to be done before the country would become thoroughly electrically minded. It was an argument very much in favour of greater publicity that so much had already been accomplished with such comparatively small financial backing. He had been amazed when he had been told the relatively small amount which this enormously important industry had, up to now, considered requisite for a nation-wide drive in salesmanship and publicity. It was all rubbish to say that Press advertising did not pay. It was greater rubbish still to argue that the woman of to-day, whose tastes had such an important bearing on the electrical industry, had not time to read advertisements in the paper. Proof to the contrary was seen in the fact that the campaign of E.D.A. to get an additional million consumers of electricity had already resulted in tens of thousands of new consumers being obtained, and there was every sign that by the end of the first three months of the year 250,000 new consumers would have been connected.

In responding, VISCOUNT FALMOUTH referred to the improvement in the position during the year 1935; the number of undertakings now affiliated to E.D.A. was 411. Nevertheless, the aim was to make E.D.A. 100 per cent. representative of the supply industry, and he expressed the hope that those undertakings not yet within the fold would join during the coming year. After expressing regret at the resignation of so great an electricity supply authority as Mr. R. P. Sloan from the Council, and mentioning the resignation of Sir William Ray, through ill-health, from the position of executive chairman, Viscount Falmouth paid tributes to the work of the members of the Council, and particularly to that of Mr. P. J. Robinson, as chairman, during the year. He went on to speak of the position of the electricity supply industry, divided as it is into the manufacturing and supply sections, with E.D.A. as the liaison between the two, endeavouring its hardest to educate the public and make known the advantages of the uses of electricity.

The greatest endeavour in the future would have to be concentrated on the householder, whose load in the aggregate could be enormous. Every house should be wired with many points for all kinds of service, and supply authorities should see to this and charge on a good two-part tariff, actively using E.D.A. propaganda.

In 1910 there were 700,000 consumers of electricity in Great Britain; at the end of 1935 there were 6,500,000. The output of electricity in 1910 was 1,000 million units, but in 1935 it was 14,000 million units. During the past five years there had been an increase of no less than 60 per cent. in output.

Mr. P. J. ROBINSON (Chairman of Council) said that as one who had been more used to carping criticism than intelligent and constructive suggestion, the President's remarks were particularly gratifying to him. Referring to the amount of money available for propaganda he said that here was an industry with a capital invested of over £500,000,000 and they succeeded in raising the gigantic sum of a little over £90,000 per annum for propaganda! He mentioned a large food firm which spent £184,000 per annum on advertising, although its capital was only £1,500,000. Why was it not possible to get more money for publicity in the electricity supply industry? He suggested that the best means of encouraging those supply authorities who at present did not pay their full quota was to raise the standard of efficiency of E.D.A. so that they would wish to become subscribers. He believed that, correctly surveying the activities of the past year, they were rapidly reaching that position in E.D.A. He therefore appealed to engineers and chairmen of committees to make fuller use of the facilities which E.D.A. was able to offer. There were experts on the staff prepared to help any undertaking requiring their assistance. He appealed to engineers to support by buying E.D.A. literature and showing more E.D.A. advertisements in their showrooms and in the local Press. There had been some criticism of such a large percentage of the revenue being spent on national advertising, but that policy had been adopted after the most careful consideration and discussion with the best experts in the industry. The value of the provincial Press was fully appreciated, and E.D.A. was willing to subsidise undertakings generously for collective advertising in areas provided they submitted their schemes to headquarters. In conclusion, he thanked the members of the Council for their unswerving loyalty to him during his year of office, and added that the efforts of the Council had been ably backed up by Mr. Cramb and the whole of the staff.

The Annual Meeting

At the annual meeting Mr. P. J. Robinson submitted the report and accounts. In the course of the discussion a delegate suggested that next year more money should be spent on the British Industries Fair, and the chairman promised that this should be taken into consideration.

Mr. J. W. J. TOWNLEY (West Ham), referred to the fact that during the year two special officers had been appointed to deal with certain specific matters and suggested the expansion of the work of the Industrial Heating Committee.

The Chairman of Council replied that the point made by Mr. Townley was the very object of the appointment of Mr. Ackery and Mr. Honey, and their services were available to the industry. He remarked that perhaps the reason why not so much had been done by E.D.A. in the past in the direction indicated by Mr. Townley was apathy on the part of the members in making use of the available facilities.

Mr. A. E. MCKENZIE (Wimbledon) urged a still greater exploration of the domestic water heating field, and recommended all supply engineers to study the report of the Domestic Water Heating Committee shortly to be issued.

Mr. F. W. PURSE, commenting on the reference in the report of the Council to refrigeration, remarked that the Gas Light and Coke Co. started a scheme last year by which gas refrigerators of a capacity of 2 cu. ft. were offered for 2s. 6d. a week for five years. He believed, however, that arrangements could be made with the manufacturers of electric refrigerators to supply a 3 cu. ft. machine for five years at 2s. 6d. per week, i.e., a 50 per cent. greater capacity refrigerator for the same money, or for three years at 3s. 9d. per week. There was no reason why 300,000 or 400,000 electric refrigerators should not be turned out each year on terms better than gas.

A question was put as to the advisability of publishing the names of those supply authorities which had resigned membership. The Chairman of Council expressed the view that, as negotiations were going on with a view to bringing in those who were not at present members, it would be advisable to leave this matter as it was put in the report. At the same time, the position with regard to resignation of provincial companies was that there had been amalgamations which reduced the number of authorities, but the subscriptions were there. In answer to a question as to why the subscriptions from companies were small compared with the others, the chairman said this matter was being dealt with.

Some discussion also took place with regard to the resignation of Sir William Ray, and questions were put as to future policy. The Chairman of the Council, replying on this matter, said the position was rather a difficult one, and he asked that it be left in the hands of the Council to deal with. Actually,

Electrical Manufacturing in 1935

THE Chairman of the Council, Mr. J. A. Hirst, presided at the annual meeting of the British Electrical and Allied Manufacturers' Association on March 19th, a report of which we have received at the time of going to press. Before opening the business of the meeting Mr. Hirst referred to the death of Mr. D. N. Dunlop, and the meeting stood in tribute to his memory. The chairman then presented the Council's annual report. He said that the Association was in constant touch with the various Government departments and was consulted whenever questions arose affecting electrical manufacture. In addition, the Association acted for the electrical industry in applications for variations of duties on electrical goods.

The work of standardisation, one of the primary activities of the Association, continued to grow. "Conditions of Contract" was one of the first subjects which brought manufacturers together in the formation of B.E.A.M.A., and the work continued to increase in importance and in its ramifications. The Association's conditions were now accepted by buyers at home and abroad as being fair and reasonable.

The Association continued to co-operate in a most friendly manner with other kindred associations. A member of the B.E.A.M.A. Council, Mr. Arthur Berkeley, had recently been elected chairman of the E.R.A. The Council had under consideration the desirability of holding a National Electrical Exhibition in London, possibly in 1938. In this investigation the Association was receiving the support of E.D.A.

The review of the trade position, without expressing optimism, conveyed the impression of the confidence which was generally felt to-day. Given a reasonable degree of political stability a continuance of good trade conditions for a lengthy period could be expected.

Upon the death of Mr. Dunlop, Mr. Watlington was appointed sole director of the Association, and under his direction the work had proceeded most smoothly and efficiently.

The following had been elected by ballot to fill vacancies on the Council:—Belliss & Morcom, Ltd.; D.P. Battery Co., Ltd.; Elliott Bros. (London), Ltd.; Evershed & Vignoles, Ltd.; Ferranti, Ltd.; and Mather & Platt, Ltd.

Later in the afternoon the Council met and the following unanimous elections were made: Mr. E. S. New as chairman of the Council and Mr. J. A. Hirst as vice-chairman.

The Annual Report

In the course of its report for the year ended December 31st, 1935, the Council says that the international political situation is obscure; trade restrictions, despite pronounced price recovery in the principal markets, are numerous and effective, and the important question of international monetary stabilisation still remains unsolved. Consequently our overseas electrical trade still remains at about 33½ per cent. below its pre-slump value.

The Empire market now absorbs about 70 per cent. of British electrical exports, a proportion increasing from year to year. South Africa takes 60 per cent. of British exports of electrical machinery and is our best customer for electrical apparatus. The definite agricultural revival throughout the world in 1935 was a welcome set-off to what, without it, might have meant a diminution in Empire trade. But a resumption of overseas investment involves a rise in interest rates, and some decline in building activity at home, which would affect the demand for domestic electrical apparatus.

At home, new high records for current consumption during 1935 resulted in a fairly general upward movement of turnover figures in electrical manufacture. Orders for heavy plant reached the highest level since the slump. While the business in motors and in turbines showed some increase, transformer orders remained at the 1934 level, and switchgear turnover was also stationary. Heating and cooking appliance manufacturers experienced better trading conditions. Raw material prices rose considerably during the year and an increase in finished-product prices is perhaps overdue.

The increasing popularity of electricity, together with intensive building activity, gave an increased turnover to manufacturers of smaller apparatus, and the manifold and increasing applications of electricity to domestic life should ensure a continuance of this increase. Imports of apparatus increased slightly compared with 1934, and amounted to almost 44 per cent. of exports, a state of affairs that, considering the practical exclusion of British electrical products from foreign markets, is unsatisfactory. The protection afforded by the present import duties on such lines as accessories, small motors, instruments, &c., still leaves much to be desired.

The number of insured workpeople in heavy-plant manufacture increased, and the proportion of unemployed diminished. Cable apparatus and lamp manufacture showed the greatest improvement from the employment point of view. The number of insured persons in wiring and contracting again rose considerably, but the percentage of unemployment remained very high, indicating that the influx of labour to this section of the industry is excessive. The total number of insured employés in July, 1935, was 270,970, compared with 257,830 in the previous year.

On the invitation of the Government Committee on Electricity Distribution the Council presented a memorandum giving the views of the manufacturing section of the industry, and two Council representatives gave verbal evidence.

A long section of the report is devoted to the work of the two Tariff Committees—home and export—and we hope to make further reference to this next week. The remainder reviews such matters as the activities of the Revising Committee standardisation, the deliberations of the Mining and Flameproof Enclosure Committee, education, traffic, fair trading, E.D.A., electrical research, and the I.M.E.A./B.E.A.M.A. Joint Committee.

E.D.A. in 1935 (*Continued from preceding page*)

the resignation of Sir William Ray had not been received by him until that morning. He, together with Mr. Taite, had been given an absolutely free hand to deal with the matter. The case was an extremely sad one, for Sir William Ray was suffering from an incurable disease, and it had been ascertained that that disease developed approximately last November twelvemonth. It was impossible for him to make any pronouncement on future policy at the moment, but he expressed the view that if the members had patience with their Council they would find that the Association would go ahead by leaps and bounds in the future. No hurried action would be taken, and the question of future policy as regards direction would be considered from all angles.

The report and accounts were then adopted.

After the announcement of the election of Lord Eltisley as President for the coming year it was also stated that Alderman J. Chuter Ede, M.P., and Alderman J. W. Longley had been elected Vice-Presidents. The meeting closed with various votes of thanks. Mr. C. D. Taite, who has been vice-chairman during the past year, will assume the chairmanship in succession to Mr. Robinson.

The Annual Report

The report for the year ended December 31st last, presented at the annual meeting, records a net increase of eight in the membership and a total income of £90,408, against £85,970 in 1934. Of this the Central Electricity Board provided £44,699 (against £42,261); Joint Electricity Authorities £487 (£482); local authorities £33,078 (£31,392); London companies £3,232 (£3,193); power companies £4,328 (£3,898); provincial companies £4,158 (£3,893); Dominion and foreign undertakings £424 (£395); while £2 (£456) was received in donations.

The seventeen committees held a total of ninety-four meetings; the No. 1 Co-operation Committee, upon which a number of manufacturers' representatives serve, held five, and the No. 2 Committee (representing contractors and wholesalers) held one. The former discussed such matters as jubilee floodlighting, the Building Centre exhibits and railway electrification propaganda, while the question of a National Electrical Exhibition was considered. Dealing with the resolution for co-operation passed at last year's National Convention, the Committee decided that the formation of another body was unnecessary. The attention of the No. 2 Committee was directed to the subjects of supply authorities' installation departments, showrooms, and hire and hire-purchase schemes.

Reference is made to the E.D.A. films, over 6,700 performances of which were given during the year, and to the "Million New Consumers" campaign. Details are given of the Association's national and local Press advertising schemes and of its many other activities during the year. The part played in a number of national and local exhibitions is detailed, and there is a note on the prominent part taken by E.D.A. in arranging the Jubilee floodlighting of buildings.

The committees on special subjects, as domestic water heating, electric cooking, industrial heating, refrigeration, electricity in small dwellings, and rural and agricultural electrification, have done important work during the period. As the result of the activities of the Electric Vehicle Committee of Great Britain, several extensive orders for vehicles have been placed. Proposals are under consideration for the formation of three branch committees. A large number of undertakings are now quoting ½d. per kWh for off-peak accumulator charging. Appended to the main report are particulars of the work of the E.A.W. and the Area Committee.

The income and expenditure account shows an excess of income over expenditure of £5,424, against an adverse balance of £2,070 for 1934.

Meetings and Discussions

Boiler Feed Treatment
Electrical Wrapping Devices
X-Ray Cinematography

Chemical Aspects of Boiler Maintenance

AT a meeting of the London Technical Group of the ELECTRICAL POWER ENGINEERS' ASSOCIATION in London last week a paper was read by Mr. A. A. POLLITT on "Some Chemical Aspects of Boiler Plant Maintenance," in which the author pointed out that in this country the most common and troublesome scale-forming material was calcium sulphate, the solubility of which decreased as temperature rose. Increase in steam pressure had, therefore, the direct effect of facilitating its precipitation, and the position was further aggravated by high rates of evaporation, two to four times as much water being evaporated per unit of surface as compared with the older practice. Again, the increased water temperature was conducive to certain forms of corrosion which were more severe and differed in many respects from those common to lower temperatures. Mr. Pollitt therefore suggested that full responsibility for the condition of the feed and boiler waters should be given to a qualified chemist who should be provided with adequate facilities.

The effect of scale on heat utilisation or thermal efficiency was comparatively small, its most important effect being the over-heating of the boiler metal occasioned by its presence. A $\frac{1}{16}$-in. thick scale did not occasion more than two per cent. reduction in boiler efficiency, or even less if the scale was dense and had a relatively high coefficient of heat conductivity. In high-pressure plant extremely thin scales could be responsible for tube failures. If the rate of heat transfer to the tubes exposed to severe radiation were taken as 75,000 B.th.u. per sq. ft. per hr., it could be calculated that with a boiler pressure of 600 lb. the tolerable thickness of scale was only 0.085 in. if the metal temperature was not to exceed 900 deg. F. If the scale was porous, the tolerable thickness was only 0.032 in. With 800 lb. per. sq. in. a scale thickness of 0.002 in. would constitute a danger.

In spite of all precautions traces of lime, sulphate and silica might gain access to the boilers, and although the quantities might be small they were cumulative. The prevention of scale could be accomplished by introducing into the boiler water a chemical which would react on the scale-forming matter to produce a substance which was non-scale-forming, but which remained as a sludge amenable to blow-down. For moderate pressures and where sulphate of lime scale had to be counteracted, sodium carbonate had been adopted, particularly in America, but it was open to criticism. A more satisfactory material, whether for intermediate or for high pressures, was tri-sodium phosphate. This salt was stable even at the temperature corresponding to the critical point, and its maintenance in concentration in correct ratio to the concentration of scale-forming salts was therefore ensured. It offered a more complete insurance against scale, since the products of its reaction with scale-forming materials were entirely non-scale-forming. Sodium pyrophosphate might also be used to safeguard against deposition in the feed lines. It could not, however, be used to effect reduction in the alkalinity of boiler water, as could sodium metaphosphate, which could also, in certain cases, be used instead of tri-sodium phosphate, the reaction in that case effecting a reduction in the alkalinity of the boiler water.

Caustic embrittlement investigations had been proceeding for about twenty years and were still not satisfactorily completed, though a definite measure of success had been achieved in that means for avoiding this form of failure had been indicated and had proved effective in practice. Embrittlement took the form of cracks which followed the crystal, or grain, boundary of the metal and always occurred below the water line and in places where the highest localised stresses might be anticipated to occur. Wherever embrittlement had been found the boiler had been supplied with feed water containing carbonate of soda and little or no sulphate, and the water had developed high caustic alkalinity due to the conversion of the carbonate to caustic soda. A secondary factor was stress, and the presence of silica, even though in minor quantity, was also essential. The chemical reactions were not completely understood, but the hydrogen released by the action of caustic solutions on iron was an important factor. The addition of sodium sulphate appeared to be the most obvious remedy, and it had been shown experimentally that if sufficient of this salt was added to the boiler water to maintain a ratio of $Na_2SO_4/NaOH=1$ to 3 (according to operating pressure) no embrittlement occurred. Care in riveting and caulking of seams might go far in minimising embrittlement risks, while welded and forged drums should provide still further immunity.

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Wrapping Goods Electro-mechanically

IN a paper that was read at the INSTITUTION OF MECHANICAL ENGINEERS in London on March 20th, MR. F. GROVER, of the Forgrove Machinery Co., Ltd., Leeds, described how the first chocolate-wrapping machine was made in that city in 1901. It needed two operators and its speed was 100 pieces per minute, compared with 550 pieces in the case of a modern machine.

A printed wrapper fed from a reel intermittently cannot be relied upon to keep register with the tablets. Therefore, the paper strip is perforated for registering by means of mechanical pins passing through the holes; or electro-mechanically, in which case the paper becomes an insulator for a low-voltage current. Two contacts are spaced just slightly wider apart than the diameter of the perforation and are lowered on to the web each time it stops. If the paper is in the correct position neither contact will complete the circuit. If the paper advances, the forward circuit is energised and an electromagnet pulls over the control bar, say to the right. If the paper lags behind, the other circuit comes into play and the bar is pulled over to the left. These differential movements are easily made to regulate the feed, and have the advantage that the correction of positive or negative feed is working about a central point which represents the precise length of wrapper. In consequence of this feature the control is much closer to the mean length wanted.

Some controls are made to act only one way. In these gears the web is given a slight bias in the forward direction, and when the several positive errors add up to, say, $\frac{1}{32}$ in., a trip operates so that $\frac{1}{16}$ in. is taken off the next cut. This means that the error is only controlled to within $\pm\frac{1}{32}$ in. of the mean length.

In the case of the light cellulose webs now in use, printing and perforating are not easy and, in consequence, are entirely new method is adopted which depends upon the action of light on a photo-electric cell. These cellulose wrappers are transparent and a beam of light focused on the web will pass through it and set up a minute current in the cell placed on the other side of the sheet. This is amplified so that relays and magnets may be operated and levers moved to effect changes in the feed. The great advantage of this form of control is that some opaque part of the design printed on the web can be used as the registering point.

When the web used as a wrapper is itself opaque the light beam and the cell are placed on the same side of the wrapper. The beam of light is projected at an angle and reflected by the wrapper on to the cell.

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The Value of Cine-radiography

THE paper in which Dr. R. J. REYNOLDS described cinematographic X-ray apparatus, to which reference was made last week, was discussed at the INSTITUTION OF ELECTRICAL ENGINEERS in London on March 19th. Mr. R. S. WHIPPLE opened the debate by declaring that before long apparatus of this sort would be in use in all hospitals. The combination of cardiograph records with sound tracks could throw new light on heart disease. The indirect method of photography employed by the author would probably be used in cathode-ray recording as well. The synchronous speed-changing gear incorporated in the author's equipment was of ingenious design. Dr. F. J. FRANKLIN, speaking as a physiologist, said that the outfit which had been installed at the Institute for Medical Research at Oxford would be of very great value, since the science of physiology was largely the study of movement. In co-operation with Prof. R. Janker, who worked in Germany on the same lines as the author, he (Dr. Franklin) had been able to solve certain problems which could not have been settled otherwise. It was a marvellous method of teaching students, and the technique promised an enormous future of very great value. Prof. E. W. MARCHANT said that optical lenses of British manufacture were now available which were equal in every way to those of foreign make as used by the author, while Major B. BINYON suggested that cine-radiography might be applicable to industrial research, say, as a means of watching the process of gradual crystallisation. Reference was made by Mr. F. JERVIS SMITH to the method of super-sensitising camera films for short periods. Mr. L. E. C. HUGHES said that a trace of nickel in cathode-ray tubes would prevent screen afterglow.

Correspondence

Contributions from readers are welcomed. The writer should give his name and address, not necessarily for publication

Earthing and Testing

In the fifth paragraph of his interesting article in your March 13th issue, Mr. H. R. Taunton refers to "earthers" and "all-insulaters" in a manner which leads one to think that the protagonists of all-insulated apparatus are being confused with those individuals who oppose the earthing of conductive casings. I am by way of being an "all-insulater" (or is it "all-insulator"?), but where, whatever the reason, metal-clad apparatus or the like is in use, then I support the latest I.E.E. edict—that is, in practically all situations, earthing is necessary.

I agree that Regulation No. 1001 is a "teaser." Mr. Taunton believes that it is futile to lay down that saddles, &c., need not be earthed. Unfortunately, experience shows that this kind of explanation is necessary in some quarters. Those who drafted No. 1001 and other prolix regulations must, I feel, have known this.

Mr. Taunton considers that Clause B of Regulation No. 1002 is "quite impracticable." Why so? Let me tell Mr. Taunton not only that it *is* practicable, but that it is a veritable godsend when (as is only too frequent) one installs cookers and the like in kitchens and sculleries fitted out with baths. He says the bathroom may be more or less a show-place. Maybe, but we don't want it to be a lethal chamber.

And, again, referring to the placing of bathroom switches outside the bathroom, he states that such is "impracticable to the point of fatuity." Does he not know that there must be thousands of jobs where, owing to the almost-unbelievable smallness of bathrooms and for other reasons, the switches *are* situated outside?

If only Mr. Taunton had used some of your space to persuade contractors to buy *and use* testing apparatus!

G. E. MOORE.

Sunderland, *March 17th.*

Prosperity and Payment

Much has been written recently regarding the investigations of the McGowan Committee on the subject of the distribution of electricity, and evidence has been taken from a great many people, including experts and laymen from all parts of the country. Attempts have been made to forecast the findings and recommendations of this Committee, and it seems to be generally agreed that some benefits will accrue to users of electricity throughout the country.

One has only to observe the dividend lists of recent years to appreciate how many millions of pounds have been paid out to shareholders by the numerous power and light companies. I have yet to hear that the McGowan Committee has taken any evidence from the engineering staff of these companies or that there is any immediate prospect of their conditions and financial status being improved. It is a fact that many of these companies have no recognised system of grading and have not therefore adopted the N.J.B. Schedule. Consequently many of the employés are sadly underpaid, and it is not uncommon to find assistant engineers receiving from £2 10s. to £3 per week whilst carrying out very responsible duties, and possibly having to maintain a small car on a very meagre transport allowance.

A few of the companies run contributory pension schemes, but these are generally so inadequate that they scarcely bear thinking about. For example, one such scheme which has been brought to my notice provides for entry at 21 and retirement at 65. The maximum possible pension payable to any grade of engineer at a retiring age of 65 under this particular scheme would be approximately 52s. per week, which is, of course, totally inadequate. This does not in any way compare with the pensions obtainable in municipal service, where the salaries and conditions of employment are so much better.

Surely it is time that the employés who have helped to make the electrical supply industry what it is to-day should participate in the fruits of their labour, and at least be able to look forward to a comfortable existence in their old age. If private concerns will not help to improve the status of the engineer and allocate a small fraction of their profits for his financial betterment then it is to be hoped that one of the recommendations of the McGowan Committee will be nationalisation of the whole of the supply industry.

ENGINEER.

March 23rd.

Long-lived Dynamos

Mr. Bushroyd's remarks on page 893 of your issue of December 27th last are of interest to me, as I happen to be the individual who supplied and fitted the carbon brushgear to Mr. Snow's dynamo. The machine was originally used to charge a 100-V battery, but about 1923 I replated the battery and, due to gasfilled lamps being available, the voltage was reduced to 50.

There was, and probably still is, at work in Auckland, N.Z., an old surface-wound overtype dynamo, and it is used for arc welding. It is driven by a 460-V d.c. motor through one stage of gearing, and has a heavy flywheel fitted to its shaft.

The firm of Wilders, Crowmarsh, Wallingford, Berks, may still have a very old generator, which I put to work for them and to which I added carbon brushgear about 1924.

G. L. PAYNE.

Matamata, N.Z., *February 2nd.*

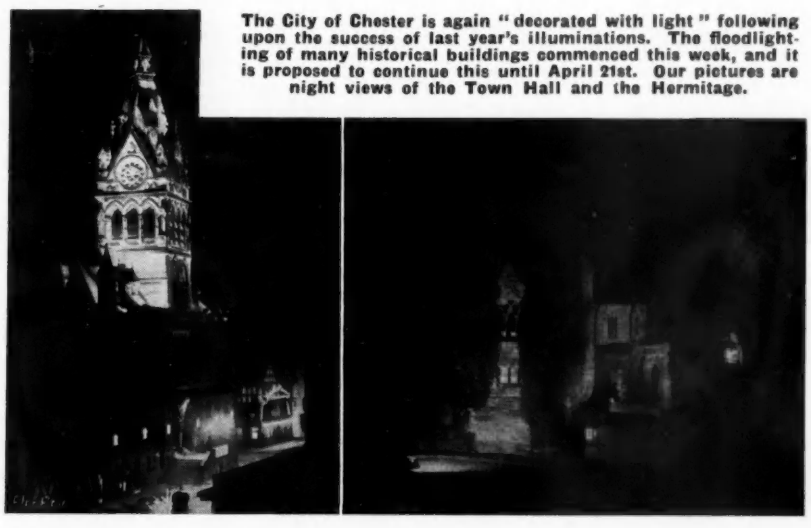
An Infinitely Varying Tariff

The many expressions of opinion on supply tariffs in the technical Press indicate the absence of any very clear conception of the problem. The "all-in" school would dispose of the whole difficult business by a generous gesture: to sell all energy for whatever purpose, and (what is more important), at whatever time, at a low rate dependent upon the total kWh used per annum.

In the meantime new tariffs, each one adding to the general complexity, are being devised on the tacit assumption that the "all-in" advocates are not quite right, but which show no very decided conviction. Occasionally a still small voice is heard, such as that of "Major" in a recent letter to the REVIEW, in which he draws attention to the part played by existing tariffs in multiple form (although complex) in the development of the electricity supply industry.

The "all-in" tariff is wrong because it takes no account of the time when energy is used, and its effect would be the creation eventually of enormous peak loads resulting in a higher cost per kWh. Multiple-tariff systems aim (subconsciously) at the levelling of the load curve; but they are at best a compromise. Lower rates are offered for heating, not because they are necessary but because heating is generally used at a time when the greatest demand is not being made upon the station.

As electricity cannot be generated at one cost only, except in the special circumstances of a level load curve, it cannot be sold at an unvarying price. The selling price is a function of the total load curve, and only an infinite number of selling prices can approach a "scientific" tariff that would result in the generation and sale of energy at the lowest rates. In any established system, however, the load curve follows



The City of Chester is again "decorated with light" following upon the success of last year's illuminations. The floodlighting of many historical buildings commenced this week, and it is proposed to continue this until April 21st. Our pictures are night views of the Town Hall and the Hermitage.

a regular average form. For example, in the tropics, where there is scarcely any departure from the average load curve form due to seasonal variation, the load curve is a function of time in any one day.

Energy therefore should be sold on a time basis in which the selling rates are infinite in number and proportional to the load on the station. This is secured in one design* of energy meter by means of a cam-controlled multiplying device interposed between the kWh train and a further train on which total cost is integrated. The radius vector of the cam determines the instantaneous rate per kWh and the cam is rotated one revolution in twenty-four hours by means of a synchronous or other clock. The cam profile cannot provide a regular reduction to polar form of the load curve. The radius vector during peak periods could be obtained by multiplying that portion of the load curve by a factor greater than unity, and low load vectors by applying a factor less than unity to off-peak periods. These might be called "deterrent" and "encouragement" factors; their quantitative evaluation appears to be complex, but an approach might be made from the aspect of the additional plant that peak conditions would make necessary (with due allowance for the difference between low and high-load periods).

Of two undertakings, one in which the load curve is practically level and one in which the peak is a good deal higher than the average load, the latter would increase its deterrent factor over peak periods because of (1) the cost of added capacity, and (2) the unused availability in existing conditions. The former would, however, be justified in installing extra capacity without alteration of the vector factors.

Conditions in a tropical undertaking are simple, but even in the highest latitudes the greater variation of load curve form, due to seasonal influences, is met by the attachment of three cams instead of one to the 24-hour clock-spindle with provision of suitable "throw-over" mechanism. The cams can be arranged for summer, winter and equinoctial load-curve forms to achieve the same object.

An infinitely variable tariff is based upon an economically exact principle; simplifies accounts (which can, if necessary, be made out on the consumer's premises by an untrained staff); requires only one meter for the most diversified installation; ultimately produces a level load curve; encourages to the fullest extent the use of heat-storage apparatus by consumers, and makes them "load-curve conscious"; and automatically takes account of diversity.

Standing charges may be continued in conjunction with an infinitely variable tariff, but the same object can, perhaps, preferably be obtained by an increase of the basic rates with a rebate allowance based upon the total amount of the consumer's bill and his connected load.

H. H. MANSON,
Electricity Department, Nassau.

Nassau, Bahamas, *March 7th.*

* British Provisional Specification No. 34300, Dec. 11th, 1935.

Earthing for Heavy Currents

In a communication to the I.E.E. *Journal* (Vol. 78, No. 469), Mr. J. Collard gives figures regarding the resistivity of the earth which vitally concern the industry. The results are that the resistivity of alluvium may be as low as 200 ohm-cm., but at Trafford Park, with red and mottled sandstone, it is 10,000 ohm-cm., and even higher figures have been found. The problem of finding a good earthing contact is of growing importance with the rapid development of electricity supply, and Mr. Collard's paper shows that some districts may find it even more difficult than most people have assumed. The water pipe has been the standby so far, but it seems not unlikely that something better will be required in the future. A few years ago it was exceptional for a dwelling-house to require a 50-A fuse, but to-day, with the all-electric house becoming common, larger currents than 50 A are quite usual. Water pipes are now being covered with insulating tape to preserve them from corrosion, and this does not help their earthing properties; also, one cannot overlook the possibility of a water service being disconnected for repairs.

Even where contact with earth is certain, a large fuse may not blow, as cases have occurred where men and animals have received shocks from the earth itself. Copper spikes driven into the earth in sufficient numbers may be adequate, but they may fail if the ground be of dry sand or non-conducting rock. Earthplates buried in the ground are satisfactory up to a point, but they may suffer from corrosion, which is difficult to discover. Tests with an ohmmeter may show low resistance between plates, but it does not follow that the conductivity of the earth is sufficient to deal with a rush of thousands of amperes, particularly where large distribution plant is installed. The lead sheathing of the cables is not a trustworthy earth, partly because it is usually protected by some kind of insulating serving, and partly because the sheathing may be broken due to a severe cable fault.

Apparently the most satisfactory remedy will be to run an earthing cable in the ground to provide a reliable method of discharging leakage currents into the earth without fear of shock to anyone. Such cables could be beneficially separated from the current carrying cables and would be of a suitable non-corrosive metal laid in intimate contact with the ground. Possibly, a copper conductor sheathed with a suitable lead alloy would be effective, but this point may be left to cable manufacturers with the assistance of E.R.A. There would, perhaps, be a tendency to use a small section of earthing conductor, but this should be carefully guarded against, as the cable would occasionally have to carry heavy currents perhaps to a considerable distance where the fault occurred in dry high-resistance ground. Such a cable might possibly be connected to earth plates in a large town where the ground was of an unfavourable kind for conducting heavy currents, the earth plates being of massive construction and sunk in places where the ground had good conductivity.

TOREADOR.

March 19th.

Inquiry into the Bradford Failure

THE inquiry by the Electricity Commissioners into the failure of supply at Bradford on February 24th was opened at the Town Hall on Tuesday last by Mr. H. Nimmo (chief engineering inspector to the Electricity Commissioners), who was accompanied by Mr. A. J. McColgan (Deputy Senior Electrical Inspector of Factories). Mr. Nimmo said that the first part of the inquiry would be devoted to an investigation of the causes of the accident and the second part to the action taken to restore supplies.

The first witness was Mr. T. Roles (city electrical engineer), who stated that the switchgear at the Valley Road power station was designed for 12 kV, but was operated at 6 kV. He attributed the breakdown to the failure of an insulator (at the "spout" where connection was made to an ironclad section switch) which was of a similar nature to one which occurred on November 4th, 1932, with 3.8 kV switchgear. In that case a bakelite sleeve was punctured and the arc melted the surrounding metal casing, when the oil escaping had been ignited and had flowed over the floor. The manufacturers of the switchgear had renewed or were renewing all the insulators.

In reply to Mr. J. Hacking (Central Electricity Board) Mr. Roles stated that he could not be sure that No. 1 switch of the C.E.B. broke down, but that there was trouble in its neighbourhood.

Mr. W. Dundas (deputy city electrical engineer) said that the cable connections to the switchgear passed through the basement of the switch-house and were sealed to prevent ingress of oil. On February 24th a fault apparently developed at 6.15 p.m. on the red phase of group "Y" switch, which had previously opened at 6.9 under a surge. The ensuing fire was got under control by the station's fire-fighting apparatus. A second and more serious fault occurred further along the switch-house at 6.18 p.m., necessitating a retreat from the building. At the time of this fault the earthing transformer of the grid sub-station broke down, setting fire to the oil and cutting off the supply to the two 30,000-kVA grid transformers. The three running generators were then switched out. The main bus-bars were divided into two sections, coupled through reactors; to one were connected two alternators and one grid transformer and to the other a 30,000-kVA alternator and the second grid transformer. He considered that the fault originated in the current-transformer chamber where routine tests had indicated the insulation resistance to be below normal. Work on replacements had been in progress for two weeks, but as tests on February 12th indicated no immediate danger, priority was given to others having a lower insulation resistance. Eight switches and main and control cables in the basement were damaged. There were seventy-eight fire extinguishers in the power station

Mr. A. J. S. Waddell (superintendent, Valley Road power station) expressed the belief that the second fault took place on No. 1 C.E.B. switch immediately behind him; at that time "Y" switch was smouldering as a result of the earlier fault. Mr. R. Mitchell (shift engineer) had heard two explosions, the first at the power station slightly in advance of one at the C.E.B. sub-station in Canal Road. There was, he said, no smoke coming from the switch-house at the time, but there was from the grid. Other engineers on duty also gave evidence. The inquiry was adjourned until the following day.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

An Improved Cleaner

Outstanding features of the new "Goblin Ace" vacuum cleaner manufactured by the BRITISH VACUUM CLEANER & ENGINEERING CO., LTD., Parsons Green Lane, London, S.W.6, are a patent air-tight insulating swivel hose coupling which will not work loose, a combined dust container and disinfecting device utilising a paper bag which can be thrown away, and a "three-way" nozzle with swivel action, combining an agitator with an ingenious intensifying device.

The "Goblin Ace" vacuum cleaner

Noise and vibration have been minimised by a system of baffles, and through a specially designed suspension of the motor and fan unit. Insulation has received special attention, and provision is made for earthing.

The body of the cleaner is black, with chromium-plated fittings. The equipment includes a full set of dusting tools, contained in a two-tier storage tray which may be easily carried from room to room.

Visual Staff Signalling Units

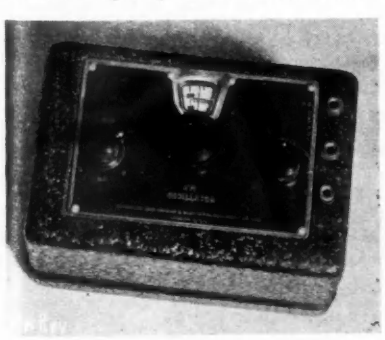
Although the "Tangent" staff locator, a product of MESSRS. GENT & CO., LTD., Faraday Works, Leicester, is not new, one or two interesting visual units for use in connection with the system have made their appearance recently. No. 291 is especially suitable for offices as it is neat and normally inconspicuous. It is designed for fixing to the wall, and is available with two, three or four lamps. A bronze finish is usual, but others such as chromium and nickel can be supplied. Another wall fixing design, No. 228, has lamps that project outward radially from a triangular or square wrought-iron "plaque."

Two "Tangent" visual signal units (Nos. 288 and 291)

No. 292 is intended for use in corridors, and takes the form of a suspended hoop with lamps projecting inwards. Unit No. 288, the standard finish of which is chromium plate, is available both as a wall-mounting unit (illus.) and for suspension by means of a ball and socket ceiling plate.

The "Avo-Oscillator"

A high-frequency signal which can be modulated at will and the frequency varied within wide limits is provided by the improved "Avo-Oscillator" made by the AUTOMATIC COIL WINDER AND EQUIPMENT CO., LTD., Winder House, Douglas Street, London, S.W.1. Unlike the earlier model it uses, instead of harmonics, the fundamental frequency bands of 100/275 kc and 500/1,550 kc, these being selected by means of a four-position rotary switch on the front of the oscillator. This switch is used both for modulation and wave-changing. The other controls are the slow motion tuning knob that varies the frequency of the oscillator, and the combined "on-off" switch and attenuator.



The improved "Avo-oscillator"

This latter gives infinitely variable volume control, instead of variations in steps which were characteristic of the original "Avo-Oscillator." Another feature is the dial, which is now directly calibrated in kilocycles, and the marking enables accurate readings to be made for lining up intermediate frequency amplifiers. To obtain frequencies in the neighbourhood of 450 kc it is necessary to utilise the second harmonic of a suitable signal in the 100/275 kc band, while harmonics of the 500/1,550 kc band may be used in order to extend the range of the instrument to the short waves. The model measures only 6 in. by 4 in. by 3 in., about half the size of the previous design, and an accuracy of within ±1 per cent. deviation is claimed by the makers. A dummy aerial is incorporated.

Bakelite Control Units

Though measuring only 6 in. by 3¼ in., a bakelite control unit made by SANTON, LTD., Somerton Works, Newport, Mon., adequately houses a 25-A single- or three-heat switch, a neon indicating lamp, and an easily accessible cartridge fuse to protect the lamp. Provision has also been made for the inclusion of two similar fuses to protect the circuit.

A Santon control unit with the cover removed

The fuses are of a new robust and compact design, and the fact that they can be withdrawn and replaced without opening the unit greatly facilitates repair work. Ample space is provided for connecting up the incoming and outgoing cables, for which there is a choice of inlets and outlets.

The four finishes available, namely, walnut, white, green and mottled grey, should match any modern equipment used in kitchens, bathrooms, offices, surgeries, &c.

A 5/2A Conversion Socket

A small plug and adaptor designed for the conversion of a 5-A socket to a 2-A size has been sent to us by MESSRS. WARD & GOLDSTONE, LTD., Frederick Road, Pendleton, Manchester, 6. Both the plug and the conversion adaptor are made so as to be interchangeable with all standard B.S.S. sockets, and the unit should have a wide market in houses fitted throughout with 5-A sockets, as it enables any 2-A plug, fused or otherwise, such as is fitted to clocks, to be connected directly to a standard socket.

The "Goltone" plug and conversion adaptor

Hair Waving at Home

Apparatus for home "perming" is a new development by the PERMATOME CO., 57, Moorfields, Liverpool, 2. It has a standard lampholder adaptor and ten bakelite curlers, round which the hair is wound and fixed into position by means of wire fasteners. There is a small bakelite switch in the flexible lead so that

The "Permatome" outfit with the asbestos-covered element removed from its sheath

the heaters, which have a total loading of 35½ W, can be switched off while the user is wearing them. Curling is stated to take from twenty minutes to three-quarters of an hour, and the price of the apparatus is about the same as that of a good permanent wave.

Unusual Electric Boilers

A wash-boiler developed by MESSRS. BURNLEY COMPONENTS, LTD., Rose Grove, Burnley, can also be used as an electric porringer. Externally, it has the appearance of an ordinary circular wash-boiler finished in mottled grey and white vitreous enamel. The elements and boiler, which has a tinned copper pan, are arranged in the usual way, but into the latter there fits a removable food container, with lid, made of heavy gauge aluminium with a frosted finish.

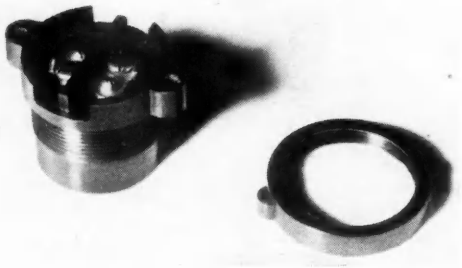
The Burnley combined wash-boiler and porringer

The water in the pan is brought to the boil quickly when the control switch is turned to high and, as the food container is completely surrounded by water, the food is cooked gently without actually reaching boiling point. A water level gauge is fitted to the outer casing and water can be added through a filler funnel at the back of the boiler. The tap is chromium-plated. Three-heat control is provided and a cut-out safeguards the element should the boiler be allowed to run dry. Three sizes are made with total capacities of 10, 14 and 20 gal. to accommodate 7-, 10- and 15-gal. food containers and heated by 3-, 4- and 5½-kW elements, respectively.

The same company makes a 6-gal. wash-boiler designed for use in flats and small houses. The boiler itself is portable and can easily be lifted from the tripod stand and stored away after use in a small space. It is of sheet-steel construction, the top and hinged lid being galvanised, while the actual boiling pan is copper tinned internally and heated by standard 2-kW elements without a safety cut-out.

A Bakelite Lampholder

The latest production by the COLLIER ELECTRIC CO., LTD., 2a, Alexandra Road, East Croydon, is a sign type bakelite bayonet lampholder with lugs for fitting at the same centres as the old type porcelain holder. Alternatively, the screwed ring may be used for one hole fixing. A brass liner is incorporated, and there is a bakelite shield between the two wiring terminals.



The new Collier lampholder

An Electric Cooker for Overseas

A recent addition to the range of overseas cookers made by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2, is the No. DC.79 buffet model. This cooker has overall measurements of 40¼ in. wide by 23½ in. deep by 39 in. high, the legs being rather more than a foot high.

The G.E.C. D.C.79 buffet cooker

The net oven cooking space is 14 in. by 18 in. by 11½ in., heated by top and bottom elements of 2 and 1 kW, respectively. There are three boiling plates, two 8-in. in diameter and loaded at 1,800 W, and the third 6 in. in diameter with a 1,000-W loading. A large warming drawer situated under the switch panel is heated by a 350-W element, so that the total loading of the cooker amounts to 7,950 W. Optional extra equipment includes four-heat hot plate control and a 2,250-W, 8-in. boiling-plate in place of the 1,800-W size.

The Latest Runbaken Products

Among a range of small electric tools introduced at the B.I.F. by RUNBAKEN PRODUCTS, 280, Deansgate, Manchester, 3, is a precision engraver which can be used for marking metal and other materials in either printed characters or script. A small internal motor drives a hardened steel point which cuts into the metal at the rate of thirty to forty times per second; all working parts are hardened and tempered. The depth and fineness of the work is adjustable and the point can be easily replaced. For extra heavy markings and for use on granite and marble a larger "Powerplus" model is made.

For marking wallets, handbags, men's hats, fabrics, silk, cards and embossing in gold and colours, the "Markex" electric pencil is available.

The new Runbaken electric razor, which uses standard "Gillette" blades, incorporates a small motor that causes the blade to oscillate two to three thousand times per minute. The speed is variable by means of a resistance and the power is obtained from a 4½-V battery.

The company has also introduced a new field-coil tester which will indicate as little as one short-circuited turn; it works on the principle of magnetic balance.

Electric Iron Developments

THE ordinary pattern of electric iron, weighing from 5½ to 7½ lb. and rated about 450 W, does not fully utilise the advantages of electric heating, says P. Woll in *Elektrotechnische Zeitschrift*. The relatively low rating involves a considerable mass of metal for heat storage, resulting in slow initial attainment of working temperature and, nevertheless, necessitating occasional pauses when dealing with large quantities of damp articles. A 6-lb. iron rated at 600 W and fitted with an automatic temperature regulator, with or without variable adjustment, permits a greater amount of work to be ironed with the same expenditure of effort and less care and attention.

The use of a comparatively heavy appliance is, however, in the author's opinion, based on the fallacy that weight is essential to the attainment of a good finish. Actually, it is necessary to make the fabric sufficiently flexible by suitable steaming, *i.e.*, by appropriate moisture and temperature, after which very little mechanical pressure is required. The requisite weight in an ordinary iron is determined mainly by the considerations that there must be a considerable reservoir of heat available by conduction, and that extra weight in the iron may compensate for unsuitability of condition of the fabric.

By combining a higher electrical rating with a high conductivity sole and a device for automatically maintaining any desired temperature over a wide range, the weight of the iron can be reduced to about 3½ lb. and new standards of performance become possible. Thus, the new Prometheus "Express" iron has an aluminium sole with an embedded heating element of 1-kW maximum loading, and a combined switch and thermostatic regulator capable of being set at any temperature between 338 deg. and 551 deg. F. The maximum sole temperature is reached in 3 min. from switching on. The high maximum loading maintains adequate ironing heat under almost any conditions of use, but the automatic cut-out keeps the average loading down to from 60 to 180 W (according to the temperature setting) when the iron is standing idle. The test figures in the table indicate the savings claimed.

	Ordinary 450-W iron.	600-W iron with Birka regulator.	1,000-W "Express" iron with regulator.
HEATING UP.			
Time, min.	19.1	9.5	3.0
Consumption, kWh	0.14	0.09	0.05
IRONING.			
Time, min.	51.6	30.9	24.5
Consumption, kWh	0.39	0.30	0.30
Weight of water evaporated, lb. ...	0.84	0.80	0.80
Thermal efficiency, per cent.	71.0	85.8	86.2
Total cost (electricity at 1.2d. per kWh and time, 6d. per hour) ...	5.8d.	3.56d.	2.86d.

The saving on the cost of electricity consumed will often be a less important consideration than the saving in time. The latter is combined with a saving of effort due to the practicability of using the lightweight high-rating iron effectively when seated.

United States Electrical Exports

EXPORT trade in American electrical goods last year continued the recovery which started in 1933. In that year the total value was $43,000,000 as against $84,000,000 in 1931, and no less than $116,000,000 in 1930. Last year the figure was $76,0004,000. From the analytical table below, which is based on the recently issued official returns, it will be seen that the recovery, compared with 1934, extends throughout all the important items.

	1935 $(000).	Inc. or dec. on 1934 $(000).
Generators, d.c.	162	+ 76
Generators, a.c.—		
Under 2,000 kVA	274	+ 130
2,000 kVA and over	282	+ 15
Steam generator turbine sets	204	+ 37
Accessories and parts for generators	355	— 52
Arc welding sets	503	+ 127
Self-contained lighting outfits	285	+ 76
Storage batteries	1,655	+ 66
Dry batteries	2,542	+ 214
Other batteries	111	+ 42
Power transformers, over 500 kVA	98	— 67
Distribution transformers, 500 kVA and less	357	+ 12
Instrument transformers	149	+ 72
Other transformers	263	+ 75
Double-current and motor generators dynamotors, synchronous and other convertors	270	+ 114
Switchboard panels, except telephone	302	+ 22
Power switches and circuit breakers over 10 A	954	+ 432
Fuses	123	+ 106
Watt-hour and other measuring meters	393	+ 155
Elec. indicating and recording instruments	773	+ 129
Motors, under 1 h.p.	749	+ 33
Stationary motors, 1–200 h.p.	1,018	+ 166
Stationary motors, over 200 h.p.	203	+ 132
Railway motors	76	— 25
Elec. locos., railway	53	+ 36
Elec. locos., mining and industrial	346	— 18
Station and warehouse elec. motor trucks	155	+ 32
Starting and controlling equipment—		
For industrial motors	823	+ 112
„ elec. railway and vehicle motors	203	+ 61
Portable elec. tools	949	+ 241
Accessories and parts for motors	1,430	+ 433
Elec. refrigerators and parts—		
Household	9,354	+ 1,174
Commercial, up to 1 ton	1,976	+ 59
Parts for elec. refrigerators	3,972	+ 497
Elec. fans	359	+ 23
Lamps for automobiles, flashlights, etc.	228	+ 8
Other metal-filament lamps	740	+ 71
Other elec. lamps	94	+ 11
Searchlights and floodlights	121	— 41
Elec. household washing machines	554	+ 231
Elec. domestic vacuum cleaners	334	+ 104
Other domestic motor-driven devices, except tools	434	+ 113
Elec. irons	179	+ 16
Elec. cooking ranges	269	+ 19
Other domestic heating and cooking devices	473	+ 130
Industrial elec. furnaces, ovens, and other heating devices	398	+ 47
Therapeutic and X-ray apparatus	1,416	+ 391
Radio apparatus—		
Transmitting sets, valves and parts	1,578	+ 488
Receiving sets	15,472	+ 134
Receiving valves	2,883	— 326
Receiving set components	4,574	+ 215
Loudspeakers	459	+ 98
Other receiving set accessories	489	— 9
Telegraph apparatus	180	— 64
Telephone instruments	239	+ 64
Other telephone equipment	1,684	+ 640
Bells, buzzers, annunciators and alarms	150	+ 55
Starting, lighting and ignition equipment	1,223	— 10
Insulating material	297	+ 26
Metal conduit, outlet and switch boxes	540	+ 90
Sockets, outlets, fuse blocks and lighting switches	813	— 75
Elec. interior lighting fixtures	706	+ 140
Electric exterior lighting fixtures	174	+ 56
Other wiring supplies and line material	663	+ 126
Other elec. apparatus	4,931	+ 1,593
Grand total	76,004	+ 9,480

Egyptian Electrical Imports

AN advance of nearly 25 per cent. in the value of electrical machinery and apparatus imported into Egypt occurred last year as compared with 1934, the totals being £E830,000 and £E680,500 respectively (Egyptian £=£1 0s. 6d. approx.). The increase was spread over every important group and was notable in the cable and radio sections of the trade, two branches in which the United Kingdom does not lead, although she is well to the front in many other groups. That competition is growing from several countries will be seen from the following table, which is based on the official returns and shows the value of imports last year, with a note of increases or decreases as compared with 1934.

	1935. £E.	Inc. or dec. £E.
Generators, motors and transtransformers, 1,000 kW or over—		
Total	43,000	+ 13,000
From United Kingdom	7,000	— 1,000
„ Germany	15,000	+ 11,000
Ditto, 50 to less than 1,000 kW—		
Total	51,000	+ 10,000
From United Kingdom	16,000	— 2,000
„ Germany	7,600	+ 3,600
Ditto, less than 50 kW	13,600	+ 4,000
Dry batteries and parts—		
Total	17,600	+ 5,600
Accumulators and parts—		
Total	28,700	+ 7,900
From United Kingdom	17,700	+ 8,400
„ Germany	3,200	+ 800
„ United States	4,700	+ 400
Fans, electric—		
Total	6,500	+ 3,000
Wireless valves—		
Total	10,400	— 300
Electric lamps—		
Total	47,000	+ 3,000
From United Kingdom	4,100	— 2,700
„ Germany	5,500	— 100
„ Holland	18,000	+ 5,500
„ Hungary	9,300	+ 1,100
„ Japan	4,600	— 1,400
Electro-medical apparatus—		
Total	21,400	+ 2,100
Telegraph and telephone apparatus—		
Total	69,400	— 7,300
From United Kingdom	63,000	— 10,600
Radio receiving sets—		
Total	176,000	+ 20,000
From United Kingdom	7,900	— 1,800
„ Germany	10,000	—
„ Holland	66,000	+ 24,000
„ United States	83,000	+ 3,000
Submarine and underground insulated cable—		
Total	62,000	+ 22,000
From United Kingdom	6,500	+ 1,600
„ Belgium	16,400	+ 7,400
„ France	5,000	— 1,200
„ Germany	22,700	+ 7,900
Other insulated wire and cable—		
Total	38,500	+ 7,900
From United Kingdom	10,700	+ 4,900
„ Belgium	7,600	— 4,200
„ Germany	12,600	+ 5,200
Insulating tubes, metal-covered—		
Total	6,100	+ 400
Electrical apparatus, not specified—		
Total	189,000	+ 57,000
From United Kingdom	52,000	+ 8,500
„ France	33,300	+ 18,700
„ Germany	54,600	+ 17,900
„ Switzerland	5,000	— 10,400
Domestic irons—		
Total	600	—
Other domestic apparatus	15,400*	+ 7,100

* Includes refrigerators £E3,000 and water heaters £E1,900.

New Books

The Superheterodyne Receiver. By A. T. WITTS. Pp. 160; figs. 82. London: Sir Isaac Pitman & Sons, Ltd. Price: 3s. 6d.

This is a second edition of a work, reviewed by us on February 22nd last year, which we suggested should be valuable to amateurs, students and radio service men. Progress during the last year or so has been such that it has already been found necessary to modify and enlarge it so as to justify its claim to deal with modern practice. Descriptions of some of the receivers contained in the previous edition have been superseded by particulars of later models, and notes have been added on the more recent heterodyne developments, such as variable selectivity all-wave receivers, car radio and automatic tuning correction. Among the new matter are a description of frequency changing without rectification and a chapter on practical receiver testing. The author does not aim at giving practical hints on the design and operation of receivers, but at presenting a theoretical survey of the subject without mathematics.

Electrical Engineering Economics. By D. J. BOLTON, M.Sc., M.I.E.E. (Second edition.) Pp. 365; figs. 45. London: Chapman & Hall, Ltd. Price 21s. net.

The first edition of this book appeared in 1928. It filled a gap in electrical literature, for, apart from common fundamental economic principles applicable to all branches of engineering, there were many matters connected with electrical engineering that rendered specialised treatment essential. Even so, a certain amount of adverse criticism was made by various power engineers, who felt that any such treatment was entirely academic. Obviously, purely theoretical considerations might be a more dangerous extreme than purely practical considerations; but a sound knowledge of all underlying economic factors is surely the best foundation on which experience and local or individual requirements can be based.

There is little change in the first part on general principles—capital, interest, sinking funds, total and annual depreciation; but the second and third parts, on choice of plant and supply problems, have been recast. When considering alternative tenders for cables, transformers, motors or lamps, no general solution applicable to all cases is possible. Nevertheless, difference of opinion is more likely to arise concerning allowances to be made than on the mathematical basis of admitted facts. Few, however, will disagree with the contention that the transformers installed in this country during the last few years are likely to cost some hundred of thousands of pounds per annum in losses, some of which could have been prevented at an economic price.

Supply problems (tariffs and load, diversity and power factors) are even more thorny, but the author tries to get to the bottom of each in a thorough way.

A valuable feature of the book is the large number of genuine, completely worked examples, enabling the reader to interpret readily the results arrived at. The book can be strongly recommended to those on the commercial side of engineering as one of the best of its kind.

Alternating Current Machines. By A. F. PUCHSTEIN and T. C. LLOYD. Pp. 582; figs. 309. London: Chapman & Hall, Ltd. Price 25s.

The subject of a.c. machinery is so wide that adequate and homogeneous treatment of all its branches within the compass of a single volume is difficult. The authors of the present work have attempted this formidable task, and have achieved a considerable measure of success. Their general policy in dealing with the various types of machines has

been to discuss them under the aspects of construction and basic theory, operating characteristics, testing and the interpretation of test data, and the examination of phenomena allied to operation.

The scope of the treatment cannot be said to be quite uniform. Alternators and synchronous motors are dealt with very fully, and the mathematical discussion of the dynamic conditions of parallel operation is lucid and complete. Similar ample treatment is given to the static transformer and the polyphase induction motor. There is a satisfactory discussion of the single-phase motor in relation to the cross-field theory, but the references to its operating characteristics and to the general subject of starting induction motors is, from the practical point of view, somewhat scanty.

The treatment of rotary convertors is sufficiently ample, while the chapters on the mercury-arc rectifier, although rather brief, are generally good. The final sections deal with commutator motors, particularly of the series and repulsion types. In point of penetration of treatment, these sections fall well below the earlier parts of the work. The mathematics used by the authors is generally simple, and the use of the methods of the calculus is sparing. A selection of problems for solution is found in an appendix, and there are copious lists of references to other text books and to original papers.

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Shorter Notices

"Einführung in die Symbolische Methode der Wechselstromtechnik," by Prof. Dr. Otto Müller. Pp. 93; figs. 35. Leipzig: Dr. Max Jänecke. Price Rm. 4.80.—In this book, which is intended as a manual for students of electricity, Professor Müller deals with the symbolical method of calculation in a.c. technique in a broad way so that a reader with only a moderate knowledge of mathematics can follow it. Many practical examples are included to accustom the student to the use of vectors, &c. It is, of course, written in German.

"Phenomena in High-Frequency Systems," by August Hund. Pp. 642; figs. 359. London: McGraw-Hill Publishing Co., Ltd. Price 36s.

"Foundations of Physics," by R. Bruce Lindsay and H. Margenau. Pp. 537; figs. Price 22s. 6d.

Parliamentary News (BY OUR SPECIAL REPORTER)

IN the House of Commons on March 17th Mr. Hepworth asked the Minister of Health whether he had any statistics to show the number of local authorities owning electricity undertakings who refused to give their tenants a choice between gas and electricity, and what was the attitude of his Department on the subject in respect of all houses for which any subsidy was granted by the State.

Mr. Shakespeare said that he would draw his hon. friend's attention to the provisions of Section 27 of the Gas Undertakings Act, 1934, which made it unlawful for a local authority to insert in any instrument in connection with the sale or letting of houses which it owned a provision restricting the right of the owner or occupier to take a supply of gas.

Dunston Power Station

On March 18th Mr. Whiteley asked the Minister of Transport whether the Dunston power station had been assisted financially by the Government; and, if so, whether there was any form of Government control.

Mr. Hore-Belisha said that no direct financial assistance had been given by the Government to this station. Under the Development (Loan Guarantees and Grants) Act, 1929, an interest grant was made to the Central Electricity Board for accelerating the standardisation of frequency in the North-East England area, which indirectly affected all electricity undertakings in that area. Dunston, being a selected station for the purposes of the grid system, would operate under the directions of the Central Electricity Board.

Caledonian Power Bill Rejected

On March 18th the Caledonian Power Bill, which provides for the incorporation of a public company with powers to generate electricity and acquire land in the counties of Inverness and Ross and Cromarty, came up for second reading in the House of Commons.

Mr. Ramsey moved its rejection. He said that the Bill would upset the rating system in Scotland. Sir M. Macdonald, opposing the Bill, said that the Government was in reality giving a subsidy to the company.

Sir W. Alexander said that the industry concerned was of very great importance. Carbide of calcium played a great part in engineering, shipbuilding and every metal industry. The industry was also vital to us in case of war and ought to be one of our first lines of defence. It was said that the industry should be placed in a derelict area and the carbide made by steam power, but its production by steam power could not compete with its production by water power.

Lord Clydesdale supported the Bill on account of the urgent necessity of having adequate supplies of carbide in the United Kingdom. There was no reason why carbide should not be successfully manufactured in this country provided cheap electrical power was available.

Mr. Cooper, Lord Advocate, said that there were features in the Bill which were definitely objectionable and others which would require the most careful scrutiny. The valuation and rating provisions were unacceptable to the Secretary of State. Moreover, there did not appear to be in the Bill in its present form sufficient safeguards for the various interests which were liable to be injuriously affected by the construction of these works. It was estimated that the number of persons whose livelihood was likely to be adversely affected by these operations was exceedingly small. It should be a condition of the grant of powers that it should be made clear that hydro-electric energy was essential for the economic production of calcium carbide, and that it would not be practicable to establish this industry—as they would like to do—either in the industrial belt of Scotland or in one of the distressed areas. The defence services, as well as the Board of Trade, from the standpoint of civil interests, regarded the establishment of carbide manufacture in this country as of such national importance as to deserve the most careful consideration. He admitted the grave defects of the Bill, but these could be remedied in Committee.

Mr. C. Williams said that if the Government had made up its mind on a definite line of public policy, was it in favour of developing and encouraging the use of water power as this Bill did, or did it wish to exert every effort to utilise our surplus coal? Mr. Cooper said that he would not make any pronouncement of policy outside the scope of the Bill, but unless it was demonstrated that the production of calcium carbide by electricity was preferable to its production by means of coal he would prefer to see the industry established in a coal area. That was a matter which he expected the Committee would determine by evidence.

Sir G. Ellis said that calcium carbide could not be produced in this country by any source of power against the competition of Canada and Norway unless it was given protection. Presuming that the protection was given, members had to ask whether the supply which it was suggested could be produced in Scotland was going to be so much better than the supply which could be produced in a distressed area by means of coal. Mr. Davidson asked the House to reject the Bill in view of the fact that the natural beauty of that part of the Highlands would be marred.

Mr. Assheton said that the promoters were asking for a concession amounting to £20,000 a year at the expense of the ratepayers of Inverness. The promoters were asking for compulsory powers to expropriate private owners of property not in the interests of the public but in the interests of a private company trading for profit. There was no necessity for this factory to be established on the proposed site. It would be better to have it where coal could be procured, but if it were established at the proposed site it could get all the power it required from the Lochaber Power Company.

The Bill was rejected by 199 votes to 63.

In the Courts

IN the House of Lords, consisting of Lords Blanesburgh, Macmillan, Alness and Roche, Sir Stafford Cripps, K.C., concluded on March 20th his argument (which had lasted several days) on behalf of the Mullard Radio Valve Co., Ltd., who appealed from the judgment of the Court of Appeal affirming the judgment of Mr. Justice Farwell in the Chancery Division dismissing the action which the company brought against Philco Radio and Television Corporation of Great Britain, Ltd., George Robinson & Son, Ltd., and London Piano & Radio, Ltd., for an injunction (and the usual ancillary relief) to restrain the alleged infringement by the defendants of the appellants' letters patent No. 287958 dated December 24th, 1926, relating to an invention for "improvements in or relating to circuit arrangements and discharge tubes for amplifying electric oscillations."

The main question in the case was whether the appellants' claims 2 and 5 were invalid for want of subject matter (as the defendants pleaded) and Mr. Justice Farwell so holding dismissed the action, his judgment being upheld by the Court of Appeal.

At the conclusion of Sir Stafford's argument Mr. Whitehead, K.C., addressed the House in support of the decisions of Mr. Justice Farwell and the Court of Appeal on behalf of the respondent companies.

Breach of Coal Mines Regulations

At Stirling Sheriff Court on March 19th a miner pleaded guilty to a contravention of the Coal Mines Regulations. The charge was that in a mine in which safety lamps are required he unlocked and opened an electric safety lamp in the working place, which was not a lamp station. A fine of £2 10s. was imposed.

Business and Industrial Notes

The Week's News. Showrooms and Exhibitions. New Installations. Overseas Trade. Publicity Material. Trade Announcements. Prices of Materials. Liquidations and Bankruptcies.

"Teething Troubles" at Swansea

At a meeting of the Swansea Borough Council last week reference was made to "teething troubles" at the new Tir John station but the Mayor, who is also chairman of the Electricity Committee assured the members that there was nothing seriously wrong with the station; such troubles as existed were common to all new plant. The resolution upon which the debate was based called for the appointment of a special committee to investigate the staffing arrangements at the station "as well as the desirability of retaining association with the National Joint Industrial Board." Among the matters raised was the length of shift worked by engineers at the station—said to be twelve hours, and a suggestion that a deputy to Mr. J. W. Burr, the borough electrical engineer, should be appointed to gain experience of the station by the time Mr. Burr retired.

London Electricity Undertakings' New Offices

The whole of the engineering staff of the London Associated Electricity Undertakings, Ltd., has recently been transferred from the headquarters in St. Martin's Lane to a new four-storey building erected at 11 and 12, Maiden Lane, W.C.2, on a site occupied by one of the company's "ancestors," the Charing Cross and Strand Electricity Supply Corporation, Ltd., as long as forty years ago. Just inside the entrance is an inquiry office and the whole of the first three floors is used as offices with the exception of a large control room on the second floor, handling by telephone the direct current supplies for the West End and City areas. In an all-electric flat on the fourth floor the hot water supply is provided by a 30-gal. Heatrae heater. A thermostatically controlled installation supplied by the J.P. Tubular Heater Co., Ltd., warms the building throughout, and there is a Smith's clock in every room. An Express lift operates between the floors.

The exterior and control room of the new Maiden Lane offices of the London Associated Electricity Undertakings, Ltd.

Wages in the Cable-making Industry

The Joint Industrial Council for the Electrical Cable-making Industry announces that there will be no "cost of living" alteration in wages on the third pay-day in April.

An Industrial Exhibition at Blackburn

A trade exhibition is to be held at Blackburn from June 10th to June 20th to be known as the North East Lancashire Industries and Blackburn Municipal Exhibition. It will be staged on the municipal motor parking enclosure at Duke Street, where a large building covering 35,000 ft. of floor space is being erected. There will be 265 stands.

A Lighting Conference at Coventry

That employers of labour are realising the importance of lighting in their works as a definite aid to greater efficiency was demonstrated by the large attendance of works executives at a two-days' conference held recently in Coventry under the auspices of E.L.M.A. Lighting Service Bureau, the Coventry Electric Supply Department, the Electrical Contractors' Association and other electrical interests. The Mayor of Coventry welcomed the delegates, and in his address at a luncheon given by E.L.M.A., which was presided over by Mr. C. W. Sully (director), he alluded to the growth of Coventry's undertaking. He said they were now installing an additional 30,000-kW unit, and he understood that the Department had received directions from the Electricity Commissioners to proceed with a further unit of a similar capacity. He criticised the length of the life of lamps, and suggested that the explanation why the average life of lamps was not 1,000 hours was because the manufacturers were making lamps at too great a pressure and were not giving sufficient attention to detail. Mr. Sully, in reply, defended the lamp manufacturers by saying that the public often used lamps beyond their point of real efficiency. Mr. W. J. Jones, secretary of E.L.M.A., opened the conference proper in the Coventry Corporation's showrooms with an address on the "science of seeing," the subsequent discussion being opened by Mr. W. J. Marston, city electrical engineer. An address on "Modern Industrial Lighting" was given by Mr. J. W. Howell, D.L.C., A.M.I.E.E., and the discussion was introduced by Mr. W. Turner (H.M. Inspector of Factories, Coventry). Mr. C. A. Hughes addressed the conference on the characteristics of various classes of lamps. Lighting installations and problems were discussed on the second day. During the conference numerous demonstrations were given.

Employment in February

Employment in the engineering industry during February improved generally and was good in electrical engineering. The *Ministry of Labour Gazette* states that the number of unemployed in the engineering industry decreased by 2,363 to 98,131, and the percentage from 10.2 to 10 (13.2 in February, 1935). In the electrical engineering section the number of unemployed was 5,342 or 5.7 per cent., as against 5.9 per cent. in January and 7.7 in February, 1935. The unemployed in the electrical wiring and contracting industry were 5,279, rising from 14.3 to 14.9 per cent. (14.7 per cent. in February, 1935). In the electric cable, apparatus, lamps, &c., group, the number of unemployed was 14,603, the proportion increasing from 10 to 10.3 per cent. (10.9 per cent in February, 1935).

Cable Shortage in the Irish Free State

Inconvenience and delay caused by the shortage of certain classes of cable have been the subject of complaints to the Society of Irish Electrical Traders. At a recent meeting of the Society the secretary read a communication from the Department of Industry and Commerce to the effect that the Minister was prepared to issue duty-free import licences to members of the Socity on being satisfied that home-produced cable was not available. It was decided to write to the Department asking that a deputation should be received on the matter.

Erith Electrical Exhibition

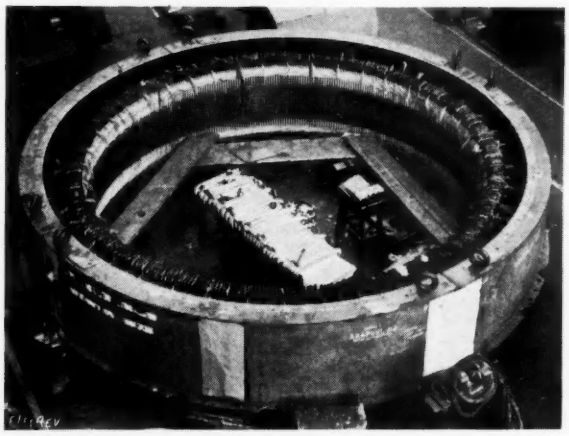
Remarkable figures indicating the growth of the Erith electricity undertaking were given at the opening of the Urban District Council's first electrical exhibition at the Exhibition Hall, Walnut Tree Road, on Monday. Paying tribute to the courage and foresight of the original members of the Electricity Committee in 1903, Councillor G. C. Humphreys, who himself has been a member of the Committee for thirty-one years and its chairman for twenty-five, said that it was largely due to them that the electricity undertaking was the town's finest

asset. In 1905 sales of electricity amounted to only 580,000 kWh. For the year ending March 31st, 1936, the estimated sales were no less than 22,000,000 kWh, and to-day 97 per cent. of the houses in the area were connected to the mains. He had been severely criticised in 1908 for opposing the sale of electric cookers on account of the high initial and running costs. Now, however, largely due to the research work on the part of the manufacturers, both appliances and electricity were cheaper and he strongly urged the use of electrical apparatus, not only for reasons of economy but also for the sake of health, cleanliness, saving of labour, and safety. The exhibition was declared open by Coun. E. Skjold, chairman of the Council, a vote of thanks being proposed and seconded by Mr. Frank Clarke, M.P., and Mr. C. Pipkin. Among those participating in the exhibition are the following:—

Aidas Electric, Ltd.; Barden & Sons; Berry's Electric, Ltd.; British National Electrics, Ltd.; British Vacuum Cleaner & Engineering Co., Ltd.; Callender's Cable & Construction Co., Ltd.; Corfield Sigg, Ltd.; English Electric Co., Ltd.; Falk, Stadelmann & Co., Ltd.; General Electric Co., Ltd.; Hedley Mitchell, Ltd.; Hotpoint, Ltd.; Jackson Electric Stove Co., Ltd.; Johnson & Phillips, Ltd.; Keating & Miskin, Ltd.; Kelvinator, Ltd.; Moffats, Ltd.; Santon, Ltd.; F. W. Selfe; Simplex Electric Co., Ltd.; and Tricity Cookers, Ltd.

Waterwheel Alternators for New Zealand

The accompanying illustration shows work in progress on one of two vertical waterwheel alternators which are being



One of the Met-Vick stators for Arapuni power station being wound

manufactured by the Metropolitan-Vickers Electrical Co., Ltd., for the Arapuni power station, New Zealand. The alternators are rated at 24,000 kVA, 11,000 V., 3-phase, 50-cycles, 214 r.p.m. and are believed to be among the largest sized electrical machines of which construction has yet been undertaken by British manufacturers. The yoke is just over 26 ft. in diameter and weighs nearly 18 tons. It is of welded steel construction and is made in four sections, with special arrangements to ensure that the sections, when assembled, will always fit into correct circular form without necessity for packing or special fitting. The core is also assembled in four sections so that the stator, when completed, can be divided for shipping, the coils spanning the joints being, of course, removed for this purpose. The punchings are assembled in the yoke on dovetailed axial ribs welded to the frame, the exact location of the ribs being ensured by the use of jigs. The 11,000-V stator winding is of the diamond coil type in open slots, facilitating removal of the coils. The total weight of copper in the stator winding of each machine is nearly five tons. The station in which they are to be installed is one of the three main power houses in the North Island of New Zealand. It is connected by a 110,000-V transmission system with the Waikaremoana power station in the east and the Mangahao power station in the south of the Island. The initial equipment of the Arapuni power station was supplied by Messrs. Armstrong Whitworth and Co. The two new sets will consist of the Metropolitan-Vickers alternators and Francis type water turbines which are being supplied by Messrs. Bovings, Ltd. The other two main power stations are equipped with Metropolitan-Vickers alternators and water turbines by Armstrong Whitworth and Co. at Waikaremoana, and by Bovings, Ltd., at Mangahao.

Social Events

About a year ago students of the London School of Electrical Domestic Science, having completed the first one-year course, decided to form an Old Students' Association, the success of which was evident at the first supper-dance held on Friday last at the Casanova Restaurant, Upper Regent Street, W., nearly one hundred students and their guests attending. Dancing continued until the early hours, and it was a compliment to the Organising Committee, of which Miss Minoprio (principal) and Mrs. Major (director and secretary) are members, that everybody spent an enjoyable evening.

The first annual dinner of the male staff of Britannia Batteries, Ltd., was held on March 19th in the dance hall at Redditch Works. In the absence of the managing director, the general manager, Mr. J. H. Goodwin, proposed the toast of "The Firm," coupled with the name of the managing director, and referred to the way in which the manufacturing and selling sides of the business had been successfully reorganised during the past twelve months. The response was made by the secretary, Mr. W. Irving, and the works manager, Mr. A. J. Greenhouse.

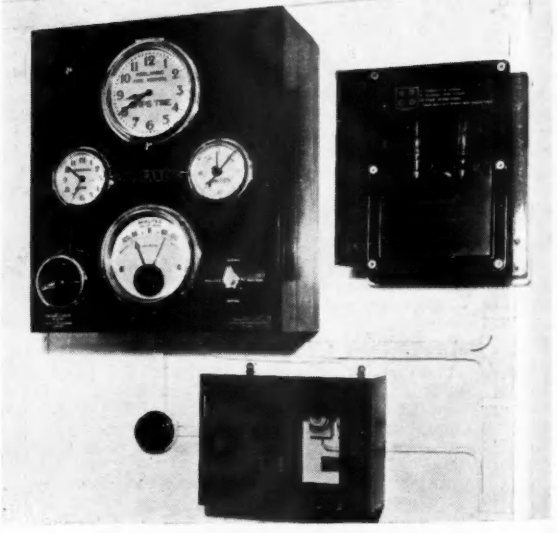
The annual staff dance of Messrs. Johnson & Phillips, Ltd., was held at Woolwich Town Hall on February 28th. Mr. G. L. Wates, the chairman of the company, Mr. C. Stewart, deputy managing director, and Mr. P. V. Brittlebank, general sales manager, together with 300 members of the staff and their friends, attended.

The annual dinner of the North Metropolitan Electric Power Supply Co., was held on Tuesday last at the Park Lane Hotel, Piccadilly, W., Lord Ashfield presiding. Following the loyal toast, Mr. F. Clayton proposed the toast of "The Northmet Co.," and said that the staff were pleased to be able to celebrate with the directors that evening the progress made during the past year. In 1923, the year of their first dinner, the total sales for 1922 were 65 million kWh. Last year the sales amounted to 495 million kWh, an increase of 71 million kWh over 1934, which was greater than the total output for 1922. The success of the company was largely due to the co-operation of the staff. Mr. E. R. Soames, in responding, said the company always had in mind its duty to consumers, to the staff and to the shareholders. A pension scheme had been organised for the staff by Lord Ashfield. The health of the guests was proposed by Mr. J. M. Donaldson, who said that 154 members of the staff had twenty years, forty-nine had twenty-five years, twenty had thirty years and one had thirty-five years' service. He was pleased to welcome among the guests Ald. J. Chuter Ede, M.P., chairman of the London & Home Counties J.E.A. Ald. Chuter Ede, in reply, said that a good spirit pervaded the electricity supply industry, in which every grade had an equal responsibility for its success. Miss M. M. Thomson (Barnet undertaking), winner of the E.D.A. Public Speaking competition, proposed the health of the chairman, and Lord Ashfield, in responding, referred to the splendid work of the organisation of the Northmet. Every department showed a record for the past year. The company had done excellent pioneer work under the inspiring leadership of Mr. Donaldson. He outlined the new pension fund which the company is introducing shortly.

On Wednesday last week the company held its ball at the Wharncliffe Rooms, N.W. This annual function remains as popular as ever and over 400 members of the staff and their friends attended. Dancing continued until 2 a.m., with an interval during the evening for an excellent cabaret show. Mr. R. A. Thorogood, the social secretary, to whom the success of the evening was largely due, acted as M.C.

Electric Timekeeping on a Liner

The *Stirling Castle* (the largest vessel launched since the *Queen Mary*) is the first big passenger liner to be provided with synchronous electric clocks showing the true or sun's time throughout the whole day, instead of being advanced or retarded at midnight. The hands of each clock move



The clock panel on the "Stirling Castle"

uniformly and not by half-minute jerks, so that noise is eliminated. Each clock embodies a self-starting synchronous motor (with its mechanism running in an oil-bath) operated from a time-controlled a.c. supply, a motor alternator being employed to convert the ship's d.c. supply. The control panel in the chart room embodies a marine clock indicating

Greenwich time, while a synchronous electric clock that contains a self-starting motor indicates ship's time. The lowest dial on the panel is that of the rate indicator, the auxiliary pointer of which can be set by hand to the position corresponding with the number of minutes which the clocks are to gain or lose during the ensuing twenty-four hours, thus compensating for the ship's easterly or westerly movement. A hand-wheel controlling the motor field circuit is adjusted until the moving pointer on the rate indicator coincides with the auxiliary pointer. The clocks in all parts of the ship will thus show the true or sun's time throughout a definite period. The small dial on the right indicates the minutes lost or gained by the ship's clocks since last reset. In order to advance or retard the clocks throughout the ship, so as to enable any interval to be picked up or dropped, the switch at the lower right-hand corner is moved to vary the speed of the motor alternator. The clocks throughout the *Stirling Castle* are of the "Synclock" type, made by Messrs. Everett, Edgcumbe & Co., who are supplying a similar equipment for the sister ship, the *Athlone Castle*, which will shortly be put into commission for the South African service.

A Visit to the Building Centre

On March 19th several prominent persons connected with the electrical industry took part in a visit, arranged by the British Electrical Development Association, to the new Electrical Section of the Building Centre, which was referred to in our issue of January 17th (p. 98).

Municipal Trading at Luton

Luton Town Council has decided that direct sales of apparatus shall be made at the new electricity showrooms, and if an electrical dealer or contractor introduces a customer he will receive the retailer's profit on the sale. The installation of apparatus sold is to be done by a rota of members of the National Register of Electrical Contractors.

Associations' Change of Address

The Diesel Engine Users' Association, the Institution of Chemical Engineers, and the Chemical Engineering Group (Society of Chemical Industry) have removed to 56, Victoria Street, S.W.1 (telephone: Victoria 1410).

Trade Announcements

The car and truck manufacturing business formerly carried on as a branch of Nelco, Ltd., has now been formed into a separate business to commence trading on April 1st next under the title Murphy Cars & Trucks, Ltd. All contracts entered into by Nelco, Ltd., will be honoured by the new company or by Nelco, Ltd., as before. No immediate change has been made or is contemplated in the personnel, productions or policy of the company.

Mycalex (Parent) Co., Ltd., has moved its offices to 100, Victoria Street, London, S.W.1.

Messrs. Bastian & Allen, Ltd., have removed to 24, Bedford Square, W.C.1 (telephone: Museum 7316/8).

Messrs. MacGregor & McCallum, Ltd., are removing their office on March 30th to 1, Newman Street, W.1 (telephone: Museum 3881).

The Birmingham office of the Jackson Electric Stove Co., Ltd., has been removed to Neville House, Waterloo Street, Birmingham (telephone: Midland 5668).

Messrs. S. Landau & Sons (Radio), Ltd., announce the opening of another branch at 31, Tachbrook Street, Victoria, London, S.W.1.

A Light-saving Device

For some time the "Dim-a-lite" attachment for obtaining five changes, "full," "half," "dim," "nightlight" and "out," with any lamp up to 60 W has been unobtainable in this country. It is particularly useful in the nursery, sick room, hall and landing, so that it is of interest to learn that it is available once more from the Sun Electrical Co., Ltd., 118-120, Charing Cross Road, London, W.C.2.

Association of Ex-Siemens Men

A spirit of good fellowship pervaded the atmosphere of the seventh annual smoking concert of the Association of Ex-Siemens Men held on March 13th at Gatti's Restaurant, London. Mr. R. Hornby presided, and a varied programme was enjoyed by the company which numbered 105 from all parts of the country.

Advertisement Correction

By a printer's error in the advertisement of the Relay Automatic Telephone Co.'s Benevolent Fund in our last issue (Supplement, p. 25) the date of the annual meeting was given as April 1st, 1936. Needless to say, the meeting is on the first of next month and is not being projected into the pre-Conquest past.

New Catalogues and Lists

Ward & Goldstone, Ltd., Frederick Road, Pendleton, Manchester, 6.—A leaflet illustrating new moulded bakelite lampshades.

British Aluminium Co., Ltd., Adelaide House, King William Street, London, E.C.4.—A booklet dealing with aluminium sections.

A. Reyrolle & Co., Ltd., Hebburn-on-Tyne.—A booklet taking the form of a technical article on "The Warming of Buildings by Electrical Thermal Storage," by John Eden.

The Medical Supply Association, Ltd., 167/173, Gray's Inn Road, London, W.C.1.—Two brochures dealing with vibro-thermy and high-frequency apparatus.

Brown Brothers, Ltd., Great Eastern Street, London, E.C.2.—A complete catalogue of domestic electrical appliances.

Tube Products, Ltd., Oldbury, Birmingham.—An illustrated art catalogue showing the various applications of the company's electrically welded steel tubing.

British Aluminium Co., Ltd., Adelaide House, King William Street, London, E.C.4.—A booklet dealing with aluminium sheet, strip and circles.

These are the thirty-one Hillman cars that have lately been purchased by Messrs. George Ellison, Ltd., of Birmingham, for use by their sales engineers

Recent Orders

Messrs. F. W. Brackett & Co., Ltd., have received an order from the Palestine Electric Corporation for the supply of three patent circulating water screens for the power station at Haifa.

The General Electric Co., Ltd., has supplied a special receiver for use in connection with the relay programmes of the new Palestine radio relay station. This receiver is to be put into commission for the reception of the Empire and other short-wave transmissions, for redistribution by the Jerusalem station on a medium wavelength of 449.1 metres.

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances:—

CHEMICALS, ETC.	Price, March 25th.	Fortnight's Inc. or Dec.
a Acid, Oxalic ... ... per cwt.	50s.	—
a Ammoniac, Sal ... ... per ton	£36	—
a Ammonia, Muriate (large crystal) ... ,,	£18 10s.	—
a Borax ... ... ,,	£17	—
a Copper, Sulphate ... ... ,,	£15 10s.	—
a Potash, Chlorate ... ... per lb.	3½d. to 4¼d.	—
a ,, Perchlorate ... ... ,,	6d.	—
a Shellac ... ... per cwt.	£4 18s.	—
a Sulphur Commercial ... ... per ton	£11	—
a ,, Roll ... ... ,,	£11	—
a Soda Chlorate ... ... per lb.	3¼d. to 3¾d.	—
a ,, Crystals .. .. per ton	£5 to £5 5s.	—
a Sodium Bichromate, casks ... ... per lb.	4d. nett.	—
METALS, ETC.		
b Aluminium, Ingots ... ... per ton	£100 to £105	—
b ,, Wire ... ... per lb.	1/1 to 1/9	—
b ,, Sheet and Foil ... ... ,,	1/3 to 2/9	—
p Babbitts Metal and Anti-friction Metals—		
Grade I ... ... per ton net	£196	£1 dec.
Grade II... ... ... ,,	£135	£1 dec.
Grade III ... ... ,,	£71	—
c Brass (rolled metal 2" to 12" basis)... per lb.	7⅝d.	—
c ,, Tubes (solid drawn) ... ... ,,	9½d. to 10d.	—
c ,, Wire, basis ... ... ,,	7½d.	—
c Copper Tubes (solid-drawn) ... ,,	10½d.	—
g ,, Bars (best selected) .. per ton	} £68	—
g ,, Sheet ... ... ,,		
g ,, Rod ... ... ,,		
d ,, (Electrolytic) Bars ... ... ,,	£41	—
d ,, ,, Wire Rods ... ,,	£47	—
d ,, ,, H.C. Wire ... per lb.	7⅛d.	—
f Ebonite Rod ... ... ,,	1/6 to 2/- plus	—
f ,, Sheet ... ... ,,	1/3 to 1/6 10%	—
n German Silver Wire ... ... ,,	2/5	—
k Gutta-percha, fine ... ... ,,	nom.	—
k India-rubber, Para-fine ... ... ,,	8½d.	½d. inc.
i Iron, Pig (Cleveland No. 3) ... per ton	67/6	—
i ,, Wire galv. No. 1, P.O. Qual.... ,,	£20	—
g Lead, English Pig ... ... ,,	£18 10s.	5s. dec.
g Mercury ... ... per bot.	£12 to £12/10/-	9/- to 7/6 dec.
e Mica (in original cases) small ... per lb.	6d. to 1/-	—
e ,, ,, medium ... ,,	5/- to 10/-	—
e ,, ,, large ... ,,	10/6 to 17/6 up	—
p Phosphor Bronze, plain castings ... ,,	1/1	—
p ,, ,, drawn bars & rods ,,	11½d.	—
p ,, ,, rolled strip & sheet ,,	11½d.	—
p ,, ,, wire ... ... ,,	1/0½	—
o Platinum ... ... per oz.	£7	—
d Silicium Bronze Wire ... ... per lb.	8½d.	—
g Spelter ... ... per ton	£16 2s. 6d.	—
r Steel, Magnet, in bars ... ... per lb.	7½d.	—
g Tin, Block (English) ... ... per ton	£212	£2 10s. dec.
n ,, Wire, Nos. 1 to 16 ... ... per lb.	3/8	—

Quotations supplied by:—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India Rubber, Gutta Percha and Telegraph Works Co., Ltd.
g Henry Gardner & Co., Ltd.
h Edward Till & Co.
i Bolling & Lowe.
n P. Ormiston & Sons.
o Johnson Matthey & Co.
p C. Clifford & Sons, Ltd.
r W. F. Dennis & Co.

The above table is published here fortnightly. In alternate issues, in which it does not appear, the latest prices of copper, silicium bronze wire, lead, rubber, tin and spelter, up to the time of going to press, are given in our "Business Notes" under the same heading.

Bankruptcy Proceedings

F. T. Wood, carrying on business as Wood and Jackson, Boundary Works, Wragby Road, Lincoln, electrical contractor.—The first meeting of creditors herein was held at the Official Receiver's Office, 1, St. Swithin's Square, Lincoln. According to the statement of affairs filed there was a deficiency of £403. Debtor said his present position was due to loss on contracts, heavy travelling expenses and insufficient capital to pay employés' "living-out" allowances. The case being a summary one was left in the hands of the Official Receiver.

W. F. Welford, "Roseberry," Alexandra Road, Shanklin, Isle of Wight, electrical engineer, lately trading in partnership as Welford, Milne & Co., 55, Regent Street, Shanklin.—This debtor attended at the Town Hall, Newport, Isle of Wight, recently, for his public examination. His statement of affairs showed ranking liabilities of £1,029 and net assets of £274, leaving a deficiency of £755. The examination was closed subject to the signing of the notes.

A. W. Hovell, 22, High Street, Beckenham, Kent, wireless dealer.—The receiving order herein was made recently on the debtor's own petition. He has filed a statement of affairs which shows gross liabilities of £3,060, of which £2,974 is expected to rank for dividend. There are net assets of £373, with a deficiency of £2,602. Debtor attributes his failure to disagreements with partners and resultant losses.

H. Shulman (Shulman & Son), electrician, 5, Bayston Road, N.16.—Receiving order made March 17th on debtor's own petition. First meeting March 30th and public examination May 12th, both at Bankruptcy Buildings, Carey Street, W.C.

N. H. P. Jones, electrical contractor, 15, North Street, Dowlais.—Receiving order made March 17th on debtor's own petition.

G. Inman, radio dealer, 121, Overton Road, Sheffield.—First and final dividend of 11¼d. in the £, payable March 24th at 14, Figtree Lane, Sheffield.

J. Newton (Gateshead Electrical & Radio Service), 23, Whitehall Road, Gateshead.—Receiving order made March 12th on a creditor's petition. Public examination May 1st at the Court House, Newcastle-upon-Tyne.

S. Hancock (S. Hancock & Co.), electrical engineer, Clyde Street, Holt Town, Manchester.—Last day for receiving proofs for dividend April 1st. Trustee, Mr. L. A. West, Byrom Street, Manchester, Senior Official Receiver.

J. Cooper (J. Cooper & Son), electrical engineer, 30, Warner Street, Haslingden.—Last day for receiving proofs for dividend April 1st. Trustee, Mr. P. M. Milward, Byrom Street, Manchester, Official Receiver.

A. Marcus (Radio & Electric Store), 58, Beatty Avenue, Matthew Bank, Newcastle-upon-Tyne.—First and final dividend of 7d. in the £, payable March 23rd at 81, St. Mary's Place, Newcastle-upon-Tyne.

H. L. Ruff, electrical engineer, 141, Abbeydale Road, Sheffield.—Public examination April 2nd at the County Court Hall, Sheffield.

Company Liquidations

Ruthin Electric Supply Co., Ltd.—Winding up voluntarily. Liquidator, Mr. R. W. Fryer, Thames House, Millbank, S.W.1. Particulars of claims to the liquidator by April 20th.

C.C.A. (Central Cables & Accessories), Ltd.—Meeting April 18th at 138, Lever Street, E.C., to receive an account of the winding-up by the liquidator, Mr. T. A. Blow.

Frank Bevis, Ltd.—Winding up voluntarily. Joint liquidators, Mr. A. R. Lapthorn, 70, Commercial Road, Portsmouth, and Mr. W. H. Crocker, 102, Victoria Road North, Southsea.

A. R. Camidge & Co., Ltd.—Winding up voluntarily. Liquidator, Mr. G. F. Davies, 159, High Street, Stoke Newington, London, N.

Private Arrangements

F. C. Hearn, electrical contractor, Dean Cottage, High Street, Rottingdean.—The creditors met on March 18th at the offices of Mr. A. E. Orbell, 6/7, Old Steine, Brighton. The statement of affairs showed ranking liabilities of £300, all due to the trade, and in addition there was a fully secured creditor for £117, who held security valued at £227. The only asset was the surplus of £110 from the fully secured creditor's claim, and that amount was subject to preferential claims of £63. The net assets, therefore, were £47, or a deficiency of £253. It was decided that the matter should be dealt with under a deed of assignment with Mr. Orbell as trustee.

R. F. Loomes, radio dealer, late 32, Earl's Court Road, London, W.—A meeting of creditors was held on March 19th at the offices of Messrs. Humphreys, Bushell & Co., Moorgate Station Chambers, London, E.C. A statement of affairs had been prepared which showed liabilities of £3,009, with assets of £19. An offer had been received from a relative to purchase the claims of the creditors for 3s. in the £, payable as to 2s. 6d. in cash and 6d. in six months. It was stated that the majority of the principal creditors were willing to accept the offer, but one creditor intimated that his firm would not accept the suggested composition, and the meeting terminated without any resolution being passed.

Recent Government Contracts

The following contracts were placed by various Government Departments during February :—

ADMIRALTY.

Motor alternators.—Newton Bros. (Derby).

Batteries.—D.P. Battery Co.; Siemens Bros.

Batteries and cells.—Accumulators of Woking (1928).

Fuse boxes.—Engg. & Lightg. Equipment Co.; Small Electric Motors.

Junction boxes.—L. Weekes (Luton).

Electric cable.—Anchor Cable Co.; B.I. Cables; Ediswan Cables; Enfield Cable Works; G.E.C.; Greengate & Irwell Rubber Co.; W. T. Glover & Co.; Hackbridge Cable Co.; Henley's; Hooper's Teleg. & I.R. Works; I.R.G.P. & Teleg. Works; Johnson & Phillips; Liverpool Electric Cable Co.; Macintosh Cable Co.; Mersey Cable Works; Met. Electric Cable & Const. Co.; St. Helens Cable & Rubber Co.; Siemens Electric Lamps & Supplies; Ward & Goldstone.

Control gear for motors.—Allen West & Co.; Igranic Electric Co.; G. Ellison.

Electric travelling cranes.—Cowans, Sheldon & Co.; Sir Wm. Arrol & Co.; Wharton Crane & Hoist Co.; Babcock & Wilcox. Sub-contractors : Motors.—Laurence, Scott & Electromotors. Control gear.—Allen West & Co.; Vlasto, Clark & Watson; E.M.B. Co.

Fan units.—W. H. Allen, Sons & Co.; G.E.C.; Verity's. Sub-contractors : Fans.—Thermotank; Davidson & Co. Control gear.—E. N. Bray; Engg. & Lightg. Equipment Co.

Steam driven generators.—W. H. Allen, Sons & Co.

Heterodyne detectors and coils.—Johnson & Phillips; Aeronautical & General Instruments.

Electric lamps.—G.E.C.; Siemens Electric Lamps & Supplies; Ediswan.

Electric bakery ovens and switches.—G.E.C.

Plugs and sockets, etc., and flashing shutters.—Engg. & Lightg. Equipment Co.

Searchlight projectors.—Met-Vick. Elecl. Co.

Signalling projectors.—Clarke, Chapman & Co.

Adhesive insulating tape.—Henley's.

W.t. transformers.—English Electric Co.

Overhead electric travellers.—Vaughan Crane Co. Sub-contractors : Crompton Parkinson for motors; Allen West & Co. for control gear.

WAR OFFICE.

Secondary portable batteries.—Pritchett & Gold and E.P.S. Co.

Electric cable.—Siemens Bros.; G.E.C.; Johnson & Phillips.

H.p. feeder panels.—B.T.H.

Transformers, &c.—Crompton Parkinson.

AIR MINISTRY.

Accumulators.—Young Accumulator Co.

Alternator set.—Davey, Paxman & Co.

Fans.—G.E.C.

Microphones.—Siemens Bros.; G.E.C.

Telephone receivers.—Telephone Mfg. Co.

Switches and cutouts.—Revo Electric Co.

Switchboxes, &c.—Phœnix Telephone & Electric Co.

POST OFFICE.

Telephonic apparatus.—Automatic Electric Co.; Ediswan; Ericsson Telephones; G.E.C.; Phœnix Telephone & Electric Works; Siemens Bros.; Standard Telephones and Cables, Ltd.

Testing and protective apparatus.—Westinghouse Brake & Signal Co.

Battery stores.—Britannia Batteries.

Cable.—B.I. Cables; Concordia Electric Wire Co.; G.E.C.; Henley's; London Electric Wire Co. & Smiths; Standard Telephones.

Electric clocks.—Gillett & Johnston.

Telephone cords.—B.I. Cables; London Electric Wire Co. & Smiths; L.P.S. Electrical Co.; Reliance Electrical Wire Co.; Siemens Bros.; Standard Telephones.

Electric lighting fittings.—Hailwood & Ackroyd; Venner Time Switches.

Batteries.—Newington & Murrayfield (Edinburgh) telephone exchanges : Alton Battery Co.

Additional loading cabling.—London-Liverpool-Glasgow (Liverpool-Lancaster, Carlisle-Beattock-Glasgow repeater section); London-Ashford-St. Margaret's Bay (Ashford-St. Margaret's Bay section) : Standard Telephones.

Cabling and loading coils.—Sheffield-Worksop-Mansfield-Gainsborough-Lincoln; Exeter-Torquay : Pirelli-General Cable Works. Sub-contractors for Sheffield-Lincoln : Salford Elecl. Instruments for loading coils. Inverness-Dingwall; Bolton-Chorley : United Telephone Cables. Sub-contractors for Inverness-Dingwall : Standard Telephones for loading coils. Sub-contractors for Bolton-Chorley : Automatic Electric Co. for loading coils. Plymouth-Torquay : Standard Telephones. Norwich-Cromer : Siemens Bros.

Cabling, loading coils and terminations.—Marlborough-Swindon : Siemens Bros. Chatham-Canterbury : United Telephone Cables. Sub-contractors for Chatham-Canterbury : Salford Elecl. Instruments for loading coils.

Electric lighting and power wiring.—Gerrard telephone exchange : Electric Power Installation.

Telephone exchange equipment.—Colindale, Sidcup and Central (London); Barnsley (Sheffield); Barnstaple : Ericsson Telephones. Lemington (Newcastle); Albert Dock and Temple Bar (London); Leigh-on-Sea; London International : Standard Telephones. Syston (Leicester); Woolwich (London) : Siemens Bros. Glasgow Central; Colchester; Midland (Birmingham); G.E.C. Portsmouth; Worcester : Automatic Electric Co. Sub-contractors for Worcester : Alton Battery Co. for batteries; Electric Construction Co. for motor generator and ringing machines.

Telephonic repeater equipment.—Elgin; Stranraer : Standard Telephones. Birmingham : Austinlite. Sub-contractors for Birmingham : D.P. Battery Co. for batteries; Electric Construction Co. for generators.

Voice frequency (telegraph equipment).—Manchester; London; Glasgow : Standard Telephones.

CROWN AGENTS FOR THE COLONIES.

Electric cable.—Standard Telephones; Henley's; Siemens Bros.

Cell spares.—Chloride Elecl. Storage Co.

Oil engine generating plant.—Bellis & Morcom.

Repeater equipment, &c., and telephone materials.—G.E.C.

Static transformers, etc.—Johnson & Phillips.

Electricity Supply

Lighting, Domestic, Power

Aberdeenshire.—QUARRY ELECTRIFICATION.—After discussing the relative merits of electrical and Diesel power the Aberdeen County Road Board has agreed to the electrification of Legatsden Quarry at a cost of £1,100, energy being obtained from the Grampian Electricity Supply Co.

Australia.—HYDRO-ELECTRIC DEVELOPMENT IN VICTORIA.—The Minister in Charge of Electrical Undertakings in Victoria has made an inspection of the Kiewa River district, where officers of the State Electricity Commission are investigating the practicability of developing a hydro-electric scheme. Proposals are also being examined for further extensions at Yallourn, as well as additional plant at Newport or Richmond, and the Kiewa River project is an alternative. The Kiewa scheme was revived two years ago by the then Chief Secretary, Mr. Macfarlan. In 1921 it was estimated to cost £3,000,000, but this sum would now be insufficient. It would produce from 80,000 to 100,000 kW, and would take three to four years to complete.

Barnes.—CHEAPER POWER.—The Town Council has reduced the charge for power from 1½d. and 0.9d. per kWh to 1½d. and 0.75d.

Barnstaple.—NEW GENERATING PLANT.—The Electricity Commissioners have agreed to the extension of the Council's power plant by the installation of two 450-kW Diesel-engine driven generating sets.

Bexhill-on-Sea.—SPECIAL BAKERS' TARIFF.—The Town Council has adopted a tariff of ½d. per kWh for heating bakers' ovens during the off-peak period, subject to a guaranteed consumption of 20,000 kWh per annum.

Bingley.—ELECTRICITY PROFITS TAKEN.—The Urban District Council has again decided to take part of the profits of the Electricity Department for the relief of rates. The Finance Committee has allocated, from the profits, £800 to central establishment charges, as in the previous year, plus an additional £600; also £800 to the relief of rates, and £75 out of the public lighting funds, making a total of £2,275 on the year's working. The policy of raiding the electricity funds brought forth a strong protest from the chairman of the Lighting and Tramways Committee.

Bournemouth.—STREET LIGHTING IMPROVEMENTS.—The Lighting Committee is to prepare a scheme for the reorganisation and improvement of street lighting.

Brighton.—ILLUMINATIONS.—The Electricity Committee has voted £500 for additional illuminations in the Old Steine and floodlighting the Parish Church and the Royal Pavilion.

NEW SUB-STATIONS.—At a cost of £3,887 the sub-station in the old mortuary at Rottingdean Heights is to be replaced by a new one in Eileen Avenue, Saltdean. Another sub-station is to be erected at Turbeville Wharf, Southwick, at a cost of £1,990, to augment supplies in the area and also to enable the provision of a stand-by supply to the Shoreham & District Electric Lighting and Power Co., Ltd.

Chester.—EXTENSIONS.—Sanction has been received by the Electricity Committee to a loan of £25,000 for extensions.

Colchester.—INQUIRY.—Mr. T. J. Atkinson, an inspector of the Ministry of Transport, held an inquiry at the Town Hall on March 13th into an objection to the proposed route of a transmission line at Layer-de-la-Haye. It was decided that the Board should investigate the possibility of a suggested deviation of route.

Croydon.—MAINS.—The Electricity Committee is to extend mains in the Broad Green area at a cost of £1,100.

Dorchester—HIRE-PURCHASE OF REFRIGERATORS.—The Electricity Committee recommends the adoption of a hire-purchase scheme for electric refrigerators and has asked the electrical engineer to prepare a scheme for assisted wiring.

Dundee.—ELECTRICITY TO REPLACE GAS.—A decision to proceed with the installation of electric lighting in Corporation houses at Taybank, Stirling Park, Craigiebank, and Forthill, which are at present illuminated by gas, has been made by a sub-committee of the Housing Committee. Only four tenants out of 160 were not in favour of electric lighting.

Edinburgh.—GRAMPIAN SCHEME INQUIRY.—On three days last week an inquiry was held into the Provisional Order promoted by the Grampian Electricity Supply Company for the purpose of authorising the company to substitute certain new works in place of those which it has power to construct, resulting in a saving of about £40,000; to extend by five years the period for the purchase of land by compulsion and by seven years the company's powers for the construction of works; to authorise the company to increase its capital by £1,000,000 to £5,000,000 and to go to the Electricity Commissioners instead of to Parliament for future increases in capital; and for rating relief, for a period of seven years, to the extent of three per cent. on the capital expenditure in connection with hydraulic works, on the grounds that the company is supplying electricity developed by water power in an area of quite exceptional difficulty. At the conclusion of the inquiry it was intimated that the application for rating relief was refused. In other respects the preamble was found proved, subject to adjustments. In regard to the capital, it was desired that there should be a new clause fixing the maximum at £6,000,000.

Finland.—HYDRO-ELECTRIC EXTENSIONS.—The important water-power plant near Imatra, the largest waterfall in Europe, is to have its capacity extended from 80,000 kW to 100,000 kW by the addition of another 20,000 kW turbo-alternator, of which there are now four. Our Scandinavian correspondent states that the work is expected to be completed during April.

A view of the existing generators in the Imatra power station

France.—ROAD LIGHTING TESTS.—Experiments in road lighting are being conducted at Mont de Marsan and between Saint-Genis-Laval and Sept-Chemins. The lamps used in both these installations are of the sodium vapour electric discharge type.

Hawkhurst.—LOWER ELECTRICITY CHARGES.—The Weald Electricity Supply Co., Ltd., has reduced the all-in tariff running charge from 1½d. to 1d. per kWh for the first 15 kWh per £1 of rateable value per quarter, and has adopted a special rate of ¾d. per kWh for water heating purposes, and a small-power tariff at 3½d. per kWh for the first 50 kWh per quarter per h.p. installed, and ¾d. per kWh beyond.

Kent.—ELECTRIC HEATING FOR CLINICS.—The Board of Education is raising no objection to a proposal to heat clinics at Crayford and Welling by electricity.

Leicester.—CHANGE-OVER.—At the direction of the Central Electricity Board, the Corporation is to change the existing d.c. parts of its system to a.c., at an estimated cost of £120,000. The work is to be spread over a period of five years.

Lewes.—REDUCED DOMESTIC CHARGE.—The Lewes & District Electric Supply Co., Ltd., has reduced the "unit" charge on the combined domestic tariff from 1d. to ¾d. for the summer quarters.

Lichfield.—SUB-STATION.—The City Council is to erect a sub-station in the Walsall Road district, and to lay a l.v. feeder and cables to Wade Street at a cost, together with equipment, of £4,216.

London.—"OLD BAILEY" TO BE REWIRED.—The entire electrical system at the Central Criminal Court is to be rewired at a cost of £10,500.

WESTMINSTER.—The London Electric Supply Corporation, Ltd., and the St. James' and Pall Mall Electric Light Co., Ltd., propose to enter into a new agreement regarding the electricity supply of St. James' parish owing to the changed circumstances which have arisen since the former company agreed, in 1910, to transfer the management and working of its undertaking in that area to the St. James' Co.

HACKNEY.—At the direction of the C.E.B., the borough Council is taking steps to extend its power station by the installation of a 30,000-kW turbo-alternator and condensing plant, two 125/150,000-lb. per hr. boilers, complete with the necessary ancillary plant, and a cooling tower having a capacity of 1¼ million gal. per hr., at an estimated cost of £290,000.

The Housing and Town Planning Committee has recently considered the extension of the electrical installations in houses on the Southwold Road, Newcome House and Powell House estates. It is suggested that the same facilities should be provided as at Banister House, namely, that there should be power points in all living rooms, sculleries, and bedrooms where there is no fireplace or where a gas fire is installed, and that the dwellings should be wired for electric cookers and wash-boilers. A canvass of the tenants of these estates revealed that over 80 per cent. of the tenants are anxious to make use of small electric fires, electric cookers, and other apparatus. The estimated cost of carrying out the work is £2,699.

The Council's architects have prepared a scheme for the development of a site at Rossington Street by the erection of a block of twenty-six flats with facilities for the use of electricity for all purposes, including lighting, cooking, and heating. There would be installed in each flat an electric wash-boiler (this would also provide hot water for the bath) and an electric water-heater. A power plug would be placed in each living room and in the small bedrooms.

The Electricity Committee has approved an estimate of £25,000 for work during the twelve months in connection with the change-over.

As a result of the deliberations of a sub-committee appointed to consider the question of amending the electricity tariffs, it

is recommended that alterations shall be made which in a full year will benefit the consumers by £28,500. As regards the lighting flat rate, it is proposed that as from October 1st next this should be reduced from 5d. to 4¼d. per kWh, all energy in excess of 500 kWh per quarter to be charged at 3½d. per kWh. At present the fixed charge under the domestic tariff is based upon the wattage of lamps, but as the result of investigations a simple and reasonable scale of charges, based upon the external dimensions of premises, has been drawn up, the minimum amount to be £1 6s. per annum for houses of 740 sq. ft., and the maximum £8 15s. for premises of 5,000 sq. ft., plus a "unit" charge of ¼d. (the present "unit" charge is ⅝d.). Prepayment meter consumers will be required to pay 1d. per week in addition to the assessed charge (minimum 7d. per week), no discount to be allowed. Consumers adopting this tariff may have lighting wiring and plug points installed by the Council at a cost of 1d. per point per week. The scale is to be applied as from the meter readings commencing October 1st next. Another change is in the method of determining the maximum demand. Instead of being on a quarterly basis, it is to be the highest demand in the months of November, December, January, and February. As from April 1st the charges under the maximum demand lighting tariff are to be £9 10s. per kW of m.d. per annum, plus ¼d. per kWh, instead of £2 10s. per quarter and ⅜d. Under the industrial power m.d. tariff the fixed charge will be £4 5s. per kVA per annum, instead of £1 5s. per quarter, with an amended scale of "unit" charges ranging from 0.5d. to 0.35d.

BRIXTON.—During the last thirty-three years Electric Avenue, Brixton, has been known as one of the most brilliantly lighted shopping centres in London, even though the old-fashioned flame arc electric lamps have continued to be the method of lighting. Recently, the work of installing modern equipment has been put in hand, and the new system was inaugurated last week by the South London Electric Supply Corporation (an associate of the County of London Electric Supply Co.). The 1,000-W "Osram" lamps are housed in seventy opal glass lanterns suspended under the canopies of the Avenue at a height of about 12 ft. 6 in., and from 15 to 20 ft. apart. The installation provides lighting of greatly increased intensity, the foot candle measurements on the footpath being between 12 and 18, and the general view afforded by the long rows of opal globes is arresting, as the accompanying illustration shows.

GREENWICH.—Last November the Greenwich Borough Council was given permission to borrow £47,394 for the erection of five blocks of flats in connection with the Lamb Lane clearance scheme. It is now proposed to borrow a further £1,646 to cover the cost of installing electricity instead of gas for lighting purposes.

ISLINGTON.—The conversion of a further 300 gas street lamps is to be carried out by the Electricity Committee at a cost of £2,000.

Oxford.—STREET LIGHTING.—An interesting street lighting installation has recently been put into operation in Banbury Road, Oxford, by the City of Oxford Electricity Supply Department under the direction of Mr. H. G. Fraser, city electrical engineer. It is the first installation of its kind in this country and consists of over eighty specially designed G.E.C. street lighting lanterns equipped with 500 W lamps. These are mounted on columns with 8 ft. projecting brackets designed by the city engineer, at a height of 26 ft. from lamp filament to road level, and arranged for 40-yd. spacing in staggered formation. The lanterns have been designed by the G.E.C. to accommodate either electric-discharge or filament lamps. A high and uniform road brightness has been achieved to an extent greater than that recommended in the recent Interim Report of the Departmental Committee on Street Lighting.

Pontypool.—REDUCED FLAT RATE.—As from April 1st the Pontypool Electric Light & Power Co., Ltd., is reducing its lighting flat rate from 8d. to 6d. per kWh.

Port Talbot.—NEGOTIATIONS WITH LONDON SYNDICATE.—Negotiations are proceeding between the Corporation and a London syndicate for the leasing of the electricity plant. The syndicate, which advocates a "trading scheme" for Port Talbot, had asked the Corporation for a purchase price, but this it refused to give.

Preston.—NEW FEEDER.—A recommendation has been passed by the Electricity Committee for a new feeder to the area north of the borough to cope with the rapidly increasing load in that district. The cost is estimated at £12,750.

Rhyl.—ILLUMINATIONS.—A scheme of illuminations is being prepared by the Electricity Committee.

Rockcliffe (Cumberland).—PROPOSED ELECTRICITY SUPPLY.—An estimate for a supply of electricity has been obtained from the Carlisle City Council.

South Africa.—KLIP RIVER STATION INAUGURATED.—The first turbine has just been put into operation at the Klip River generating station, which will be the largest in the southern hemisphere. Six turbines each of 33,000 kW are being installed, but provision has already been made for an increased capacity of from 198,000 kW to 330,000 kW. Power lines are to transmit the supply at 80,000 V to the mines of the Rand, which are the main customers. The station is the property of the Electricity Commission, but will be operated on its behalf by the Victoria Falls & Transvaal Power Co., Ltd.

Southend-on-Sea.—A SUPPLY AT WAKERING.—A supply of electricity will be available in the Wakering area next month.

FURTHER EXTENSION OF ILLUMINATIONS.—The Town Council has decided to extend its illuminations scheme at a cost of £5,600.

Sutton Coldfield.—PROPOSED WORKS.—A low-voltage supply from the Streetly sub-station to the Aston Park estate is to be provided by the Town Council, which is also to convert the d.c. system at Four Oaks estate to a.c. and to carry out mains extensions on the Bush estate, New Oscott.

Sunderland.—ILLUMINATIONS.—Another "Illuminations Fortnight" is to be held at Roker from September 12th. The features will include an illuminated lake, waterfall and Japanese bridge, and a 20 ft. pillar of light in the centre of the lake.

Todmorden.—LOANS.—The Electricity Committee is seeking sanction to borrow £10,000 for mains and services and £4,000 for apparatus to be let out on hire.

Torquay.—STOKE.—With reference to the paragraph published on page 436 of our last issue, the Teignmouth Electric Lighting Co., Ltd., write pointing out that they have been giving a full a.c. supply in the village of Stoke-in-Teignhead since January, 1931.

United States.—MODERNISING WATERSIDE POWER STATION.—The New York Edison Company proposes to spend about $5,000,000 on modernising its Waterside generating station, one of the older power houses in the company's system, states our American contemporary, *Electrical Engineering*. The new plant will comprise two boilers each having a steam capacity of 500,000 lb. per hr. at a pressure of 1,500 lb. per sq. in. and a temperature of 900 deg. F., and also a 50,000-kW turbo-generator. The steam will exhaust at a pressure of 200 lb. per sq. in., and will then pass through existing low-pressure turbines to the condenser, giving an additional 65,000-kW generating capacity. It is expected that the rate of fuel consumption will be approximately halved by the modernisation scheme.

The new lighting at Electric Avenue, Brixton

Walton and Weybridge.—EXTENSIONS.—Application for loans of £3,745 for extensions on the Silvermere and Towers estates, £8,000 for consumers' apparatus, and £2,000 for meters has been made by the Urban District Council.

Weymouth.—STREET LIGHTING IN RADIPOLE.—The Highways Committee is to provide electric street lighting at Radipole.

Wigan.—SUPPLY TO HAIGH.—The Rural District Council has consented to the Corporation supplying electricity in the parish of Haigh, and application is to be made for a Fringe Order.

Yarmouth (Norfolk).—BETTER STREET LIGHTING.—During the past eighteen months a scheme of street-lighting improvements has been carried out, and in the course of a recent inspection of the system Mr. P. E. Rycroft claimed that the town was now the best lighted in East Anglia. The total length of road covered by the improved system is sixteen miles, and about 400 new lamps have been erected.

Traction

Australia.—MELBOURNE CABLE TRAMWAY TO BE ELECTRIFIED.—Mr. H. H. Bell, chairman of the Melbourne and Metropolitan Tramways Board, states that the Board intends to electrify the South Melbourne cable tramway and to construct an extension to Flinders Street, at a total cost of £31,240. With this conversion ten cable lines will have been electrified since the inception of the Board, leaving five still to be changed. More than fifty miles of line have been converted to electric traction since 1925.

POWER SIGNALLING.—The Railway Commissioner for New South Wales states that power-control signalling will be provided throughout the State railway system. He made the announcement at Newcastle, where the major part of the railway reconstruction scheme has been completed. Hitherto, the only area where the power system was installed was at Sydney, where the electro-pneumatic method is in force.

India.—DIESEL-ELECTRIC TRAINS.—A proposal to introduce Diesel-electric trains on the Budge-Budge-Calcutta section of the Eastern Bengal Railway in order to provide an improved service is reported in the *Indian Railway Gazette*. There are numerous small stations on the route.

London.—NEASDEN RAILWAY DEPOT RECONSTRUCTION.—Demolition of the old sheds at the Neasden railway depôt of the London Passenger Transport Board has been begun prior to its reconstruction. The depôt, which is nearly sixty years old, now accommodates 550 passenger vehicles, and it was necessary to arrange the reconstruction so that there may be no interruption in the maintenance of these cars; this accounts for the comparatively long time that will be occupied in rebuilding, namely, two years. The new depôt will be the largest operated by London Transport, and will accommodate about 650 vehicles. The buildings will have a total floor area of 260,246 sq. ft., and, including sidings, the whole will cover 44 acres. The design will enable the inspection, maintenance, cleaning and washing of rolling stock to be done progressively. Cars will move forward in stages until ultimately they pass through a machine in which the exteriors will be washed. Special electric plant will be installed to clean the interiors.

London.—TRANSPORT IMPROVEMENT SCHEME.—A Select Committee of the House of Commons (chairman, Sir Henry Cautley) has this week had under consideration three Bills, complementary to each other, promoted by the London Passenger Transport Board and the G.W. and L.N.E. Railway Companies. They deal with the scheme, already outlined in the ELECTRICAL REVIEW, for the construction of 12 miles of "tube" extensions, the electrification of 44 miles of suburban railways, and the conversion to trolley-bus working of 52½ route-miles of tramways. The total cost was originally estimated at £35,000,000, but other works now included bring the amount up to £42,000,000. It was stated that nobody among the petitioners was against the scheme being carried out, the only issue being that it should be reconciled with the different interests.

TRAFFIC SIGNALS.—The Ministry of Transport has made a grant of £7,750 towards the cost of traffic signals which are to be provided on the Embankment at its junction with Northumberland Avenue. The signals will be designed to give a periodical clear passage for pedestrians.

Newcastle-on-Tyne.—RAILWAY ELECTRIFICATION.—Preliminary work is being started in connection with the electrification of the railway between South Shields and Newcastle, a distance of about ten miles. The cost will be £400,000, including the rolling stock. The L.N.E.R. has already placed contracts with Messrs. Dorman Long & Co., Ltd., and the Cargo Fleet Iron Co., Ltd., Middlesbrough, for 1,180 tons of steel conductor rails each.

Padiham.—TRAMWAY RENTAL DISPUTE SETTLED.—The dispute between Padiham Council and the Burnley, Colne and Nelson Joint Transport Committee concerning tramway rental has terminated in favour of the Council. The Committee gave notice to reduce the rent from £306 to £118 a year; Padiham Council declined to accept the proposal, and the matter was referred to arbitration.

Sweden.—STOCKHOLM.—A special committee appointed to investigate town planning is reported to have advocated the construction of an underground railway to link up the Southern and Western suburban railways.

Communications

Cyprus.—NEW TELEPHONE SYSTEM.—At a cost of £40,000 a telephone system has been installed in Cyprus. It was completed at the beginning of the year, the construction having taken eighteen months. There are exchanges in each of the six towns, and one will be set up during the summer at Troödos. To accustom citizens to the use of the telephone, the owning company is giving a free local and trunk service until April 1st, the date of the official opening. The complete trunk system is 415 miles long.

Great Britain.—TELEVISION.—The British Broadcasting Corporation has decided that the television service from the Alexandra Palace will be on 6.67 metres, sound being radiated on 7.23 metres. Application is being made by the Yorkshire Television Association for a licence to erect an ultra-shortwave television station at Gildersome.

THE ULLSWATER REPORT AND RADIO RELAYS.—According to the *Daily Telegraph*, at a recent meeting of the Council of the Relay Services Association a plan was formulated to oppose the recommendation in the Ullswater report that the ownership and operation of relay exchanges should be undertaken by the Post Office. It included a publicity campaign, and endeavours to influence Parliament. A grant of £5,000 was made from association funds to enable the work to be put in hand at once. A meeting of the southern area of the association endorsed the policy of the Council and approved its plans for a publicity campaign. On December 31st, 1935, there were 343 relay stations in existence in this country, with 231,554 subscribers. In seven towns there were over 5,000 subscribers. The percentage of relay listeners to the total licences was 3.12, against 2.84 at December 31st, 1934.

POST OFFICE "SPEAKING CLOCK."—The new service enabling telephone subscribers to receive the correct time from the "speaking clock" by dialling "TIM" is scheduled for inauguration on July 1st.

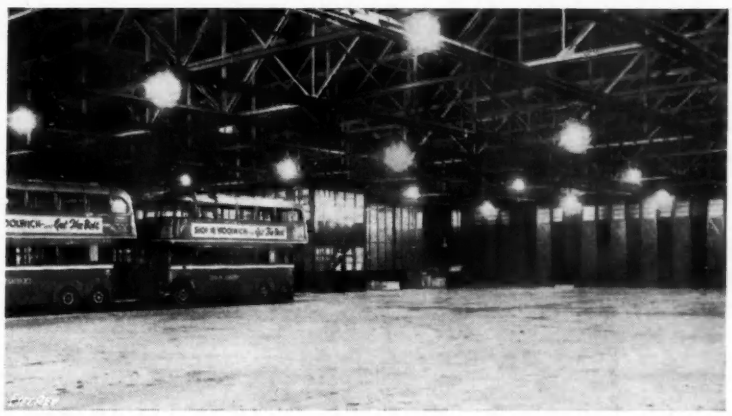
CHEAPER 'PHONE CALLS TO FRANCE.—An agreement has been concluded between the Postmaster-General and the French Minister for Posts and Telegraphs for a 33 per cent. reduction in the charges for the telephone service between London and Lyons and London and Marseilles. These reductions take effect on April 1st.

India.—BENGAL TELEPHONES.—It is hoped that a network of trunk telephone connections will soon come into operation, linking important places in north, east and west. An automatic exchange in connection with the Calcutta-Darjeeling trunk line is nearing completion, while it is proposed to connect Calcutta with Chittagong. Telephone extensions are also proposed in the Burdwan and Bankura districts, and a public exchange will be opened at Chinsurah, with junctions to Calcutta.

BUDGET GRANTS FOR BROADCASTING.—In the Budget for the coming year provision of Rs.20 lakhs has been made for the development of broadcasting.

New Zealand.—INCREASED NUMBER OF LISTENERS.—The total number of broadcast receiving licences in force in New Zealand at December 31st last was 185,008, representing an increase of more than 35,000 during the year.

Norway.—TELEGRAPH CONSTRUCTION SCHEME.—As a measure for the relief of unemployment, the Norwegian Government is to introduce a Bill enabling a sum of £250,000 to be allocated to the Post Office for telegraph work. The allowance includes £130,000 for cables, £29,000 for trunk lines, £13,750 for a high-frequency link between Oslo and Stavanger, and £76,750 for new automatic exchanges at Drammen, Trondheim, Bærum, and Halden.



The L.P.T.B. trolley-bus depôt at Bexley, Kent, lighted by means of fifty-seven 50-W Philips "Philora" sodium lamps equipped with "Esla" bi-multi reflectors

South Africa.—THE BROADCASTING BILL.—A Bill for the creation of a public corporation to control broadcasting in South Africa was read a first time on March 9th. It embodies the main recommendations made by Sir John Reith. The present African Broadcasting Company, of which Mr. I. W Schlesinger is chairman, and which operates under Government licence, will be compensated in 6 per cent. debentures redeemable in ten years.

KIMBERLEY.—Following the announcement of the Government's proposals to take over and reorganise the broadcasting services in the Union, Kimberley City Council is urging the Minister of Posts and Telegraphs to establish a broadcasting station in the town.

United States.—FACSIMILE TRANSMISSION.—The installation of apparatus for facsimile transmission from New York to Philadelphia by radio is now under way, learns *Reuters Trade Service* from New York, permission for the undertaking on an experimental basis having been granted to the Radio Corporation of America by the Federal Communications Commission. Further official action will be necessary before full commercial activity is permitted. An ultimate extension of the new services beyond Philadelphia to Baltimore and Washington is expected. The new service will transmit messages on tape similar in appearance to ticker tape. No printer will be used, however, but actual images of the messages themselves will be transmitted.

Contract Information

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Contracts Open

Aberystwyth.—March 30th. Electricity Department. Underground cables, feeder and distribution pillars and disconnecting boxes. (March 13th.)

Argentina.—BUENOS AIRES.—April 13th. State Oilfields Directorate. Diesel engines and generating sets. (T.Y. 5790.)*

Barnes.—April 14th. Electricity Department. Mercury-vapour rectifier plant. (March 20th.)

Bexhill.—April 3rd. Electricity Department. Materials for one year. (March 20th.)

Birmingham.—April 1st. Electricity Supply Department. Two 1,000-kVA transformers. (March 20th.)

Blackpool.—April 21st. Electricity Department. Meters for one year. (See this issue.)

Bristol.—April 15th. Electricity Department. E.h.p. and l.p. switchgear. (See this issue.)

Caerphilly.—April 6th. Electricity Department. E.h.p. truck type cubicle, kiosk, transformer, e.h.p. circuit-breaker and l.p. gear, e.h.p. and l.p. cables, &c. (March 20th.)

Cardiff.—April 14th. R.D.C. Electricity Department. E.h.p. and l.p. lines and e.h.p. switchgear, and one 50-kVA outdoor transformer. (See this issue.)

Cheadle & Gatley.—April 8th. Electricity Department. 6.6-kV feeder. (March 20th.)

Chesterfield.—April 9th. Electricity Department. E.h.p. and l.p. cables. (See this issue.)

Dundee.—April 7th. Electricity Department. Meters for one year. (March 20th.)

Dunfermline.—March 30th. Town Council. Electric lighting in 150 houses. D. H. Shaw, borough surveyor, City Chambers (deposit £1 1s.).

April 8th. Town Council. Electric lighting of 128 houses on the Headwell housing scheme. Borough engineer (deposit £1 1s.).

Egypt.—CAIRO.—April 30th. Ministry of the Interior. 525 single-phase and seventy-five three-phase electricity meters. (T.Y. 10434.)*

April 30th. Public Works Department. Electrical material, including lamps, domestic wiring supplies, battery plates, house-service meters, street lighting poles and lanterns. (T.Y. 10436.)*

June 9th. Mechanical and Electrical Department, Ministry of Public Works. Two boilers and one 5,000-kW turbo-alternator set complete with auxiliaries, switchgear, transformers, &c., and two house turbo-alternator sets with building work at the Atf power station. Chief inspecting engineer, Egyptian Government, 41, Tothill Street, London, S.W.1 (deposit £5 2s. 6d., not returnable).

Erith.—April 8th. Electricity Department. One 6,000-kVA outdoor type transformer. (See this issue.)

Exeter.—March 30th. Town Council. Electrically driven pumping plant, including pump, motor, starting gear, &c. City engineer, Municipal Offices (deposit £2).

Glasgow.—April 2nd. Corporation. Electrical installations in 141 houses on the Kelvindale Road housing scheme. Town clerk's office (Room 36).

Gloucester.—March 30th. Street lighting equipment and lanterns for sodium street lighting. (March 20th.)

Grimsby.—April 1st. Electricity Department. Two 6.6-kV switchboards, three transformers and two l.p. switchboards. (March 20th.)

April 3rd. E.h.p. cables. (See this issue.)

Kirkcaldy.—March 25th. Corporation. Cables, lamps and meters for one year. (See this issue.)

Kirriemuir.—March 30th. Town Council. Electric lighting in twenty-nine houses at Knowehead Crescent. J. S. Bruce, borough surveyor.

Lincoln.—March 31st. Education Committee. Electrically driven machine tools, including five lathes, one milling, one grinding, and one drilling machine and one light electric welding plant, for the Technical College. C. W. Hooton, director of education, City Education Office, 4, Lindum Road.

London.—LONDON & HOME COUNTIES J.E.A.—April 6th. Annual supply of general electrical accessories. (March 13th.)

METROPOLITAN WATER BOARD.—April 17th. Two high-compression heavy fuel oil engines with centrifugal pumps and electrical generators, three electrically driven bore-hole pumps, switchboard, &c., at the Shortlands Pumping Station, Kent. Chief engineer, Room 235, 173, Rosebery Avenue, E.C.1 (deposit £2 2s. to the Accountant to the Board.)

Manchester.—April 9th. Electricity Committee. Static transformers for one year. (March 13th.)

April 16th. A.c. motors, time switches, kettles, and meters for one year. (See this issue.)

Mexborough.—April 14th. Electricity Department. E.h.p. and l.p. cables. (See this issue.)

New Zealand.—WELLINGTON.—May 22nd. Post and Telegraph Department. Telephone switchboard cable. (T.Y. 10430.)*

June 5th. Eight miles of single solid conductor rubber-insulated taped and braided cable. (T.Y. 10447.)*

AUCKLAND.—April 28th. Harbour Board. Three 5-ton electric capstans. C. R. Butters, 100, Clifden Road, E.5 (deposit £2 2s.).

Pontardawe.—March 30th. Electricity Department. Materials for one year. (March 13th.)

South Africa.—JOHANNESBURG.—April 18th. City Council. Pole mounting cut-outs during twelve months commencing June 1st, 1936. (T.Y. 10443.)*

CAPE TOWN.—April 29th. Electricity Department. Two electric passenger lifts. (T.Y. 5816.)*

Southend-on-Sea.—April 6th. Corporation. Electrical refrigerator installation at the Public Mortuary. R. H. Dyer, borough engineer, Municipal Buildings (deposit £1).

April 7th. Electricity Department. Strip lighting, colour mediums and angle iron. (See this issue.)

Southport.—March 31st. Electricity Department. Transformers. (March 20th.)

Uruguay.—MONTEVIDEO.—May 12th. State Electricity Supply and Telephones Administration. Insulated copper conductors for outdoor use. (T.Y. 10446.)*

West Ham.—April 4th. Electricity Department. 6.6-kV switchgear for one year. (March 20th.)

Weymouth and Melcombe Regis.—March 30th. L.p. cable. (March 13th.)

*Further particulars from the Department of Overseas Trade (Inquiry Room), 36, Old Queen Street, London, S.W.1.

Contracts Closed

Ayrshire.—County Council. Accepted. Electric lighting at new primary school, Kilmarnock (£141).—W. Findlay Nelson.

Bradford.—Buildings Committee. Accepted. Electric lift at Forster Street buildings (£395).—Reliance Lift Co., Ltd. Electrical installations (£183).—Collinson Bros.

Brighton.—Electricity Committee. Accepted. Circuit-breaker (£990).—Met.-Vick. Elecl. Co. Lamps for street lighting (£759).—John Ismay & Sons. V.i.r. cables (£421).—W. Giepel & Co.

Croydon.—Public Assistance Committee. Accepted. Electrical fittings and appliances for six months.—Standard Wholesale Electrical Co.; Pryke & Palmer.

Exeter.—Electricity Committee. Accepted. 1,250 service cut-outs (£232).—Callender's.

Glasgow.—Education Committee. Accepted. Electrical work, at the Junior Instruction Centre (£349).—R. J. McIntyre.

Health Committee. Recommended. Electrical installations in the extension to Hawkhead Mental Hospital (£5,883).—Johnson & Phillips.

Housing Committee. Accepted. Electrical installations in 836 houses and seven shops at Househillwood estate (£3,517).—Darroch & Espie. Electrical installations in seventy-eight houses at Garngad (£275).—A. Moore.

Public Assistance Committee. Accepted. Electrical installation materials required for the alterations to the nurses home, Lennox Castle Institution.—Simplex Electric; W. Brown & Co.; J. T. Cartwright & Sons; Drake & Gorham; A. Lindsay. Electric clocks for the Institution (£217).—Everett, Edgcumbe.

Transport Committee. Accepted. Four-motor electrical equipment for trucks.—Met.-Vick. Co.

Kettering.—U.D.C. Accepted. Supplies for the year ending March 31st, 1937: E.h.p. and l.p. cables.—Union Cable Co. Ordinary and prepayment a.c. meters.—Chamberlain & Hookham; Venner Time Switches; Ferranti; English Electric Co. One 3-panel 6,600-V switchboard.—Ferguson, Pailin.

London.—ISLINGTON.—Electricity Committee. Recommended. 300 electric lamp fittings, with time switches (£6 each).—Revo Electric Co.

HACKNEY.—Works Committee. Recommended. One 2-ton electric vehicle (£634) and one 20/25 cwt. electric lorry (£388).—Electricars, Ltd.

Electricity Committee. Supplies for the year ending March 31st, 1937: Electrical installation cables and flexible cords:

	£		£
W. T. Glover & Co.	*1,024	Macintosh Cable Co.	5,519
Armorduct Cable Co.	*3,048	Callender's Cable & Construction Co.	5,534
W. Geipel, Ltd.	3,088	W. T. Henley's Telegraph Works Co.	5,542
Mersey Cable Works, Ltd. ...	3,092	Johnson & Phillips, Ltd. ...	5,553
General Cable Mfg. Co.... ...	*3,142	Enfield Cable Works, Ltd. ...	5,554
Kniveton Cable Works, Ltd. ...	*3,261	Siemens Electric Lamps & Supplies	5,562
Edison Swan Cables, Ltd. ...	3,276	British Insulated Cables, Ltd....	5,577
Metropolitan Electric Cable & Construction Co.	*3,503	St. Helen's Cable & Rubber Co.	5,577
Hackbridge Cable Co.	*3,592	Pirelli General Cable Works ...	6,237
Brown Bros., Ltd.	3,630	Greengate & Irwell Rubber Co.	*6,772
Crompton Parkinson, Ltd. ...	3,752		
Falk, Stadelmann & Co. ...	*3,807		
Liverpool Electric Cable Co. ...	5,513		

* Incomplete.

A comparison of the various prices showed that the tender of Messrs. W. Geipel, Ltd., when adjusted, was lowest, and this was recommended for acceptance.

Recommended. Metal sheathed, p.i. plain-annealed copper conductors and jointing materials (£1,340).—B. I. Cables.

BATTERSEA.—Electricity Committee. Recommended for twelve months: Meters.—Chamberlain & Hookham; Ferranti. Compound.—Dussek Bitumen & Taroleum. Cables.—Callender's. Service and disconnecting boxes and cut-outs.—Callender's; Henley's.

HAMMERSMITH. — Electricity Committee. Recommended. Fifty 2,200-V. single-phase metal-clad switches.—J. G. Statter & Co. Supplies for twelve months from April 1st next: Insulating compound.—Dussek Bitumen & Taroleum. Cables.—

Hackbridge Cable Co. Draw-box frames and covers.—Henley's; A. C. Woodrow & Co. Electrical goods.—W. Maxwell & Co. House service joint boxes, &c.—W. Lucy & Co. Insulating wires.—Mersey Cable Works. Meter boards.—W. White & Co. Meters.—Aron Electricity Meter, Ltd.; Met.-Vick. Co.

L.C.C.—Housing and Public Health Committee. Recommended. Extension of existing contract for wiring and fittings for electric lighting, &c., in blocks 1, 2 (part) and 4 of dwellings on the Tarn Street area, Southwark, so as to include blocks 2 (remainder), 3 and 5 (£1,751).—A. Meckhonik.

Wiring and fittings for electric lighting, &c., in 800 houses and flats at Becontree (Dagenham area):

	£
Holliday, Hall & Stinson, Ltd. Accepted	7,377
Alexander Hawkins & Sons	8,221
G. E. Taylor & Co.	8,221
Read & Partners, Ltd.	8,222
W. H. Gaze & Sons, Ltd.	8,271
Francis Polden & Co., Ltd.	8,272
Samuel Reed & Sons	8,310
Electrical Installations, Ltd.	8,320
Troughton & Young, Ltd.	8,371
Ryland's Electrical Co., Ltd.	8,899
Henfrey Electrical Installations	11,440
Harland & Wolff, Ltd.	11,738

The chief engineer's comparable estimate was £8,400.

ST. PANCRAS.—Contracts and Stores Committee. Recommended. One 6-panel h.p. switchboard for the new Town Hall sub-station (£2,879).—Ferguson, Pailin. L.p. switchboard at the King's Road power station (£1,644), one l.p. switchboard for the Town Hall sub-station (£1,818), and one electric vehicle battery charger (£80).—Met.-Vick. Co.

STEPNEY.—Electricity Supply Committee. Recommended. Supplies during the year ending March 31st, 1937: Plugs and sockets (£266).—P. L. Dwyer & Co. E.h.p. and l.p. p.i., l.c. armoured and unarmoured cables.—Henley's; Standard Telephones. 200 six-pint electric kettles.—Revo Electric Co. Alterations to existing switchgear and extensions to existing reactors at the Limehouse generating station.—Ferguson, Pailin (£47); Reyrolle & Co. (£105); Met.-Vick. Co. (£376). Seven metal-clad switches with reactors for the Limehouse generating station (£9,850).—Met.-Vick. Co.

Shipley.—Education Committee. Accepted. Electric lighting at open air school (£215).—A. Crossley.

Todmorden (LANCS).—Electricity Committee. Accepted. Motors (£2,033) and switchgear (£285).—G.E.C.

Warrington.—Housing Committee. Accepted. Wiring 136 houses on the Alder estate.—Warrington Electrical Co., Ltd. (In lieu of previous tender.)

Weston-super-Mare.—U.D.C. Accepted. Electrical work in the auditorium, Knightstone Pavilion (£183).—Colston Electrical Co. Stage lighting in the auditorium (£610).—Strand Electrical & Engineering Co.

Wimbledon.—Electricity Committee. Accepted. Twenty-two transformers (£2,232).—Yorkshire Electric Transformer Co.

Forthcoming Events

Institution of Electrical Engineers.—Thursday, April 2nd. Institution, London, W.C.2. 6 p.m. "Tariffs for Domestic and Business Premises." Mr. B. Handley. "The Prices for Electric Supply." Prof. Miles Walker.

North Midland Centre.—Tuesday, March 31st. Hotel Metropole, Leeds. 7 p.m. Annual general meeting.

Wireless Section.—Wednesday, April 1st. Institution, London, W.C.2. 6 p.m. "Thermionic Peak Voltmeters for use at very High Frequencies," and "The Theory and Design of Hot-Wire Ammeters for Frequencies of 25 to 100 Megacycles." Prof. C. L. Fortescue. "An Improved Form of Response Curve Projection Apparatus." Mr. D. G. Reid.

Meter and Instrument Section.—Friday, April 3rd. Institution, London, W.C.2. 7 p.m. "Capacitor Voltage Transformers." Messrs. J. G. Wellings, J. R. Mortlock and P. Mathews. "A Thyratron Stroboscope." Mr. R. S. J. Spilsbury.

Association of Mining Electrical Engineers (*South Wales Branch*).—Saturday, March 28th. South Wales Institute of Engineers, Cardiff. 6 p.m. "Maintenance and Testing of Electrical Plant, including Protective Gear." Mr. H. C. Davies.

Electrical Power Engineers' Association (*London Local Group*).—Monday, March 30th. Caxton Hall, London, S.W.1. 7.15 p.m. "The Development and Possibilities of the Steam Turbine for Power Stations." Mr. H. L. Guy.

Birmingham and District Section.—Friday, March 27th. Edgbaston Assembly Rooms, Birmingham. 7 for 7.30 p.m. Annual dinner.

Northern Division.—Saturday, April 4th. Midland Hotel, Manchester. 5.30 for 6 p.m. Dinner.

Institution of Heating and Ventilating Engineers.—Wednesday, April 1st. London School of Hygiene and Tropical Medicine, W.C.1. 7 p.m. "Some Miscellaneous Test Results." Messrs. A. C. Pallot and E. H. Nash.

National Smoke Abatement Society.—Thursday, April 2nd. Town Hall, Birmingham. 11.30 a.m. Address by Mr. F. Forrest. Visit of inspection of electrical flue-dust precipitation plant at Hams Hall and Nechells power stations.

Electrical Industries Benevolent Association.—Friday, April 3rd. Savoy Hotel, London, W.C.2. Noon. Annual general meeting. 1 p.m. Luncheon.

Institute of Transport.—Friday, April 3rd. Connaught Rooms, London, W.C.2. Annual dinner.

Physical Society.—Friday, April 3rd. Imperial College of Science and Technology, London, S.W.7. 5 p.m. Short papers will be read.

Royal Institution.—Friday, April 3rd. Institution, London, W.1. "The Electric Arc and its Applications." Lord Rutherford.

Notes

Co-operation in Lighting

The need for the co-operation of all connected with the lighting industry was the principal theme of the speeches at the Illuminating Engineering Society's annual dinner held at the Trocadero Restaurant, London, on Tuesday. Proposing the toast of "The Society," Mr. J. M. Kennedy, president of the Institution of Electrical Engineers, said that electricity supply now presented economic and psychological problems as well as those of production and distribution. To increase the sales of electricity it had been necessary to introduce new tariffs, including the two-part tariff, which from the illuminating engineers' point of view was a disadvantage since they were not able to find out how much energy was being used for lighting. Co-operation was necessary with the architects who were taking an increasing interest both from the utilitarian and decorative points of view. Responding, Mr. A. W. Beuttell, the president, stated that during the past year the membership of the society had increased considerably, and new sections had been formed to deal with photometry and architecture. He added that proposals were to be made to explore the possibilities of co-operation with the Association of Public Lighting Engineers, as well as with architects and consulting engineers. Other speakers included Mr. A. Cunnington, vice-president of the society, and Mr. A. M. Bell, president of the Association of Public Lighting Engineers.

A Hydrogen-cooled Generator

A turbo-generator now under construction at the works of the American General Electric Co., Schenectady, is unusual in several respects. It is a 40,000-kW set for the Appalachian electric power system at Logan, W. Va., and will use steam at 1,250 lb. per sq. in. and 925 deg. F. This set will be the first turbo-generator to adopt hydrogen cooling. The machine is to run at 3,600 r.p.m. Hydrogen is expected to reduce windage losses to 10 per cent. of what they would be with air, and this is anticipated to result in an improvement in efficiency.

I.E.E. Conversaziones

The annual conversazione of the Institution of Electrical Engineers is to be held on the evening of July 2nd, as usual at the Natural History Museum, South Kensington. The evening reunion of members from overseas is to take place at the Institution building, Savoy Place, on July 15th. Members from overseas who will be in England on that date and would like to attend should communicate with the secretary immediately on their arrival in order that invitations may be sent.

East Kent Electrical Contractors' Dinner

The annual dinner of the East Kent Branch of the Electrical Contractors' Association was held at the County Hotel, Canterbury, on March 19th, and was presided over by the branch chairman, Mr. F. J. Malpress, of Broadstairs. He was supported by the Mayor of Canterbury (Coun. C. Lefevre), Mr. A. G. Bruty (President, E.C.A.), Mr. L. C. Penwill (director and secretary, E.C.A.), Mr. S. W. Bligh (branch vice-chairman), Ald. F. Wood, Mr. F. E. Lewis (city electrical engineer), and others. Mr. Bligh, in proposing "The Guests," mentioned that Canterbury sold seven million kWh last year. The city electrical engineer, in reply, said that the city's undertaking had been a success from the start, and he paid a tribute to the help and co-operation of the contractors.

North-East Coast I.E.E. Dinner-Dance

The annual dinner and dance of the North-East Coast Centre of the Institution of Electrical Engineers was held at Newcastle on March 18th. Those present included Prof. W. M. Thornton (past Pres. I.E.E.), Mr. P. F. Rowell (secretary, I.E.E.), Mr. H. B. Poynder (hon. secretary, North-East Coast Centre, I.E.E.), Mr. D. Maxwell-Buist (Central Electricity Board), Mr. V. Z. de Ferranti and Mr. H. W. Clothier. Professor H. Louis proposed "The I.E.E.," while the chairman's health was proposed by Mr. Maxwell-Buist.

Appointments Vacant

Mechanical and electrical supervisors in the Works and Buildings Directorate, Air Ministry.

Mechanical and electrical engineer for the Government of the Gold Coast.

Examiners in the w/t and instruments section of the Aeronautical Inspection Directorate, Air Ministry.

Showroom superintendent for Walsall Electric Supply Department.

(See our classified advertisements.)

Our Service Department

EVERY day inquiries of all kinds are received by the Editors, the bulk of them relating to the producers of specified classes of electrical goods. We are able to reply to most of these with the aid of our extensive records, but in a few cases we have to seek the assistance of our readers. This week we have been asked for the names and addresses of manufacturers of the following:—

FREELIGHT transformer lamp for a.c.

CARFON vacuum cleaner (makers or agents).

Readers should enclose stamped addressed envelopes when making their inquiries.

Our Personal Column

Electrical men are invited to keep readers of the "Electrical Review" posted concerning their movements

Mr. G. V. Vaughan has been appointed electrical engineer to the Kirkcudbright County Council Electricity Department, in succession to Mr. N. T. Smith, who was recently appointed borough electrical engineer to the South Shields Corporation.

Mr. G. V. Vaughan

Mr. Vaughan commenced his electrical career with the Shropshire, Worcestershire and Staffordshire Electric Power Co. in 1921. In 1933 he was appointed assistant electrical engineer to the Kirkcudbright County Council, and has assisted in the development of the undertaking from the time of its inception.

Major G. S. Helme, A.M.I.E.E., who has been associated with Lancashire Dynamo & Crypto, Ltd., for thirty years and is now the company's manager for Scotland, has been awarded the Territorial Decoration. Major Helme received a commission in 1915 in the 3/3 Highland (How.) Brigade R.A., now the 77th (Highland) Field Brigade R.A. (T.A.), and has been with this Brigade ever since.

Lt.-Col. H. A. P. Disney, who has been appointed to the new post of Director of Production in the Air Ministry, is at present with Messrs. E. K. Cole, Ltd. Lt.-Col. Disney received a commission in the Territorial Force at the age of nineteen, and two years later became a pilot in the Royal Flying Corps in France. In 1916 he became Chief Liaison Officer in France with the Air Board, Deputy Assistant Director of Aircraft Equipment in 1917, and, later, Deputy Assistant Quartermaster-General with the Forces in Italy. He was promoted to lieutenant-colonel on the field. In 1919 he was appointed Aeronautical Adviser to the Ministry of Labour, and, later in the same year, joined the Western Electric Co., Ltd., being elected a director when the company became Standard Telephones & Cables, Ltd. He has also been a director of the International Telephone & Telegraph Co., Ltd.; Creed & Co., Ltd.; Kolster Brandes, Ltd.; and the Chile Telephone Co., Ltd. He joined Messrs. E. K. Cole, Ltd., in 1932. Col. Disney takes up his new duties on March 30th.

Lt.-Col. H. A. P. Disney

Mr. R. A. Lochner

Mr. R. A. Lochner has recently been appointed sales manager of Messrs. Laurence, Scott & Electromotors, Ltd. Before taking up his present duties Mr. Lochner was for fourteen years with Messrs. Crompton Parkinson, Ltd., with whom he occupied design, production and sales positions. He has carried out work in connection with technical improvements in power-factor correcting apparatus, a.c. commutator machines and rotary convertors.

Mr. O. G. Cook, chief electrical engineer and manager to the Bingley Urban District Council, has received an increase in salary.

Mr. G. L. E. Metz has taken over the position of export manager of Asea Electric, Ltd., London.

Mr. E. S. New, M.I.E.E., vice-chairman of the British Electrical & Allied Manufacturers' Association, was elected chairman of the Association for the session 1936-37 at the annual meeting held on March 19th. Mr. New has been a member of the B.E.A.M.A. Council since the formation of the Association in 1911. He has been associated with the accumulator industry for forty years, and is joint managing director of the D. P. Battery Co., Ltd. He is also president of the Accumulator Makers' Association.

[Elliott & Fry

Mr. E. S. New

Dr. Vannevar Bush, vice-president of the Massachusetts Institute of Technology and dean of the School of Engineering, has been awarded the Lamme Medal of the American Institute of Electrical Engineers "for his development of methods and devices for the application of mathematical analysis to problems of electrical engineering."

Mr. W. Trinfield, of Walsall, has been appointed manager of the new electricity showrooms of Luton Corporation at a salary of £400 per annum.

Mr. V. A. H. Clements

Mr. V. A. H. Clements, A.M.I.E.E., F.R.Econ.S., has been appointed head of the Power Department (Northern Area) of the North-Eastern Electric Supply Co., Ltd., in succession to the late Mr. M. F. Sheedy, and he is to take over his new duties as from April 1st. Mr. Clements, who was educated at Hurstpierpoint College, Sussex, received his engineering training at the works of Messrs. George Kent, Ltd., Luton. Subsequently, he was for a number of years employed, in London and Newcastle, by Messrs. Merz & McLellan, and joined the N.E.S. Co. in 1931, since when he has occupied the position of an assistant on the general manager's staff.

Mr. J. P. Tucker, A.M.I.E.E., engineer and manager of the Isle of Man Electricity Board, has been appointed borough electrical engineer and manager at Loughborough. Mr. Tucker served his apprenticeship at Torquay, and after the war spent three years at Loughborough Technical College. On leaving Loughborough he joined the Yorkshire Electric Power Co. as an operation engineer, later becoming sales engineer. He took up his present position in 1932.

Mr. J. P. Tucker

To mark the occasion of his impending retirement from the position of general manager of the Glasgow Corporation Transport Department, **Mr. Lachlan Mackinnon** was presented on March 19th with gifts from the Scottish Road Passenger Transport Association. The gifts took the form of two electric floor standard lamps, which were presented by Councillor T. Mitchell, con-

vener of Aberdeen Corporation Transport Committee, at the quarterly meeting of the Association in Glasgow. Councillor Mitchell referred to Mr. Mackinnon's long connection with the transport industry, extending to forty-two years. He had also been associated with the Scottish Road Passenger Transport Association for many years, and his wide knowledge of transport matters had been of considerable value to the Association. Councillor R. A. Scrymgeour, convener of Dundee Corporation Transport Committee, also paid a tribute to Mr. Mackinnon, who, in reply, said that there was a considerable amount of criticism of tramways, but the vested interests opposed to them had to be taken into account in considering such criticism.

Mr. O. S. Hosgood, superintendent engineer in charge of the Roath power station of the Cardiff Corporation Electricity Department, is to retire in May. He has been in control of the Roath station for the past thirty-four years, during which time an electric tramway system has displaced the old horse-drawn trams and the output of the plant has increased from 1,200 kW to 31,000 kW. Prior to being appointed to his present post in 1902 he was manager of the Commercial Engineering Works at Barry, Glam., which was afterwards taken over by the London and South Wales Engineering Co. Mr. Hosgood is a member of the Institution of Mechanical Engineers, an associate member of the Institution of Electrical Engineers, and a member of the Electrical Power Engineers' Association; he has held various offices in the last-mentioned organisation since its formation in 1918.

Obituary

Mr. D. W. F. Bellamy, whose death is announced at the age of forty-two, had for several years been sales engineer in the Nantwich district of the Electricity Distribution of North Wales and District, Ltd. He was the fifth son of the late Mr. C. R. Bellamy, who was the first general manager of the Liverpool Corporation tramways.

Mr. W. Bakewell.—The death occurred on March 21st, after a sudden illness, of Mr. William Bakewell, aged seventy. Mr. Bakewell, who was the principal of Messrs. W. Bakewell & Son, electrical engineers, Sheffield, had been connected with the electrical industry for over fifty years. He was the first chairman of the former Enfield Electric Cable Manufacturing Co., Ltd., which was succeeded in 1919 by the present Enfield Cable Works, Ltd.

Financial Section

New Companies. Official Returns of Capital. Debenture Charges. Reports of Electrical Companies. Dividend Announcements. Transactions in Stocks and Shares

New Companies Registered

Henry Holland & Co. (Signs), Ltd.—Private company. Registered March 19th. Capital, £2,000 in £1 shares. Objects: To acquire the neon sign and electrical business carried on by H. Holland at 76, Rosamond St. East, Manchester, 13. The subscribers are: H. Holland, 25, Claremont Grove, Didsbury, Manchester, and S. Darly, 112, Broadway, New Moston, Manchester. H. Holland is first director. Secretary: F. W. Dickinson. Registered office: 76, Rosamond Street East, All Saints, Manchester.

Insulated Appliances, Ltd.—Private company. Registered March 19th. Capital, £10,000 in 5s. shares. Objects: To carry on the business of manufacturers of and dealers in thermal appliances of all kinds, porcelain and vitreous enamellers and cabinet makers, &c. The directors are: R. A. Fulford, 12, The Causeway, Sutton, Surrey, and A. E. Leach, 20, Shirley Avenue, Cheam (directors of Marco Refrigerators, Ltd.), and M. Payne, 50, Hook Road, Surbiton (director of British Thermostat Co., Ltd.). Registered office: Manor Works, Rowan Road, Streatham Vale, London, S.W.16.

Ruda & Co., Ltd.—Private company. Registered March 19th. Capital, £2,000 in £1 shares. Objects: To acquire the business of wireless, electrical and bicycle dealers carried on by Messrs. Rudas, at Hammersmith. The directors are: L. Ruda, 35, Clavering Avenue, Barnes, S.W.13, L. C. Theobald, 10, Martindale, East Sheen, S.W.14, and R. Ruda, 35, Clavering Avenue, Barnes, S.W.13. Registered office: 137, King Street, Hammersmith, W.6.

Metropolitan Distribution, Ltd.—Private company. Registered March 20th. Capital, £100 in £1 shares. Objects: To carry on the business of manufacturers of, agents for, and dealers in wireless and television sets, electrical fittings, appliances and apparatus, &c. The directors are: A. E. Gladwell, Glendalough, Barncoose, Redruth, Cornwall, and J. D. Tucker, Homeside, Pilford Road, Cheltenham, Glos.

Mayfield Mica Products, Ltd.—Private company. Registered March 16th. Capital, £100 in 1s. shares. Objects: To carry on the business of manufacturers, factors and merchants of, agents for and wholesale and retail dealers in mica, mica products and insulating materials, &c. The permanent directors are: H. R. Ruggles-Brise, Northrepps Cottage, Cromer (chairman), and L. Kornitzer, 27, Cator Road, S.E.21 (managing director). Secretary: Beatrice E. Kornitzer. Registered office: 205/206, Audrey House, Ely Place, London, E.C.1.

Returns of Electrical Companies

Eca-Ray Sales, Ltd.—The nominal capital has been increased by the addition of £4,500 beyond the registered capital of £3,000. The additional capital is divided into 4,500 "B" participating preference shares of £1 each.

London Transformer Products, Ltd.—The nominal capital has been increased by the addition of £2,500 beyond the registered capital of £2,500. The additional capital is divided into 2,500 6 per cent. redeemable cumulative preference shares of £1.

W. J. Marchant (Electrical Engineers), Ltd.—F. B. Durrant, 47, High Street, Tonbridge, was appointed receiver on March 9th, 1936, under powers contained in debentures dated September 8th, 1934.

Ultra Electric, Ltd.—Debenture charged on the company's undertaking and property, present and future, including uncalled capital, dated February 26th, 1936, to secure all moneys due or to become due from the company to Barclays Bank, Ltd.

Robinson, Nelson & Co., Ltd.—Particulars filed of £2,000 debentures, authorised February 28th, 1936, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued, and ranking *pari passu* with debentures issued August 11th, 1932.

British Ferrocart Co., Ltd.—Capital, £100 in £1 shares. Return dated October 10th (filed November 14th), 1935. All shares taken up. £100 paid. Mortgages and charges, nil.

Low Tension Systems, Ltd.—Capital, £3,000 in £1 shares. Return dated December 31st, 1935. Two shares taken up. £2 paid. Mortgages and charges, nil.

Downton Electric Light Co., Ltd.—Satisfaction in full on February 21st, 1936, of debentures registered April 16th, 1935, securing £2,500 and premium of 2 per cent.

Hellyar & Sons, Ltd.—Thomas H. Hellyar, of 169, Church Road, Barnes, S.W.13, ceased to act as receiver and manager on March 16th, 1936.

Cable Research, Ltd.—Capital, £5 in 100 shares of 1s. Return dated December 31st, 1935. Two shares taken up. 2s. paid. Mortgages and charges, nil.

Radiovox Wireless Services, Ltd.—Capital, £4,000 in £1 shares. Return dated November 2nd, 1935. 425 shares taken up. £416 paid. £9 considered as paid. Mortgages and charges, nil. A further 135 shares were allotted for cash and fully called up on December 5th, 1935.

Directional Sound Apparatus, Ltd.—Capital, £3,000 in 2,000 preferred shares of £1 and 20,000 ordinary shares of 1s. each. Return dated October 19th, 1934 (filed July 29th, 1935). 450 preferred and 20,000 ordinary shares taken up. £450 2s. paid (£1 per share on 450 preferred and 1s. on two ordinary shares). £999 18s. considered as paid on 19,998 ordinary shares. Mortgages and charges, nil.

W. L. & F. M. Jones, Ltd.—Capital, £500 in £1 shares. Return dated December 31st, 1935 (filed March 14th, 1936). 300 shares taken up. £300 paid. Mortgages and charges, nil.

Thomas R. Hills, Ltd.—Capital, £2,000 in 1,900 ordinary shares of £1 and 400 deferred shares of 5s. Return dated December 31st, 1935. 1,741 ordinary and 400 deferred shares taken up. £1,608 paid on 1,508 ordinary and 400 deferred shares, £233 considered as paid on 233 ordinary shares. Mortages and charges, nil.

Bursiem's Patents, Ltd.—Mortgage dated February 20th, 1936, to secure £500, charged on certain inventions, &c. Holder: E. H. S. C. Legh, 8, South Audley Street, W.1.

Hants Relay, Ltd.—Capital, £9,000 in 8,000 £1 preference shares and 20,000 1s. ordinary shares. Return dated December 5th, 1935. All shares taken up. £8,000 paid on 7,619 preference and 7,620 ordinary. £1,000 considered as paid on 381 preference and 12,380 ordinary. Mortgages and charges, £1,200.

Horsham Relay Service, Ltd.—Capital, £1,000 in £1 shares. Return dated December 18th, 1935. 1,000 shares taken up. £1,000 paid. Mortgages and charges, £575.

Mid-Lincolnshire Electric Supply Co., Ltd.—The nominal capital has been increased by the addition of £50,000 in £1 ordinary shares beyond the registered capital of £400,000.

Home Installations, Ltd.—The nominal capital has been increased by the addition of £750 in £1 ordinary shares beyond the registered capital of £250.

City Notes

The County of London Electric Supply Co., Ltd., held its annual meeting on Tuesday last, when Sir Bernard E. Greenwell (chairman), who presided, said that during the year 1,567,705,070 kWh had been sold, of which the Central Electricity Board took 632,302,000 kWh. Sales to their own consumers increased by 109,308,553 kWh, while consumers connected increased by 32,000. The capital expenditure during the year was £893,590, principally on extensions to the distribution system, while in the current year they had to face heavy capital commitments, in addition to the ordinary annual expenditure necessitated by growth, by reason of the extensions of the Barking power station and the new main trunk cable system being laid between Barking and their southern areas. The

extensions to the Barking station were undertaken at the request of the C.E.B. last year, and included another 75,000-kW set, which it was hoped would be in operation by the coming autumn. The Board had recently suggested that the boiler plant should be increased by two further boilers in section B, and with these installations the total installed capacity of the whole station would be 465,000 kW. The results for the year showed that while the new plant generated 120 million kWh more than the section A plant the works cost was £115,000 less and, by reason of the thermal efficiency being 28.1 per cent. as against 21.8 per cent. for section A, the extra kWh was obtained with a 54,600 tons lower consumption of coal. The combined efforts of the two stations showed an improved thermal efficiency over 1934. Last year's demands necessitated the running of the Wandsworth station to the extent of 19,500 kW, and the purchase of energy from the C.E.B. Over £580,000 was spent on new mains and the reinforcement of old mains, and this involved the provision of seventy-four miles of h.p. mains, another 400 miles of l.p. mains, and 156 new substations. The work on the new 66,000-V trunk mains from Barking to Wandsworth was well advanced, and it was hoped to have the use of these cables for next winter's load. With regard to coal prices, it was not properly appreciated that the supply for industrial purposes was a competitive supply, and the addition of a fraction of a penny per kWh added to a quotation might sway a prospective industrial consumer in favour of oil. The question of the price of coal as compared with oil was serious, and any great disturbance of the present relationship might drive the industry to construct Diesel plant stations in outlying areas. To meet the growth of their load they, together with the C.E.B., had under consideration a proposal to build another large generating station in the area of one of the subsidiary companies, but arrangements and terms had not yet been settled. Relations with the Central Board were satisfactory, but recently they had made a claim on the Board on the grounds that the working with it during the year exceeded the cost which would have been incurred had it never existed. At some future time the 1926 Act would have to be amended to ensure more equitable treatment of the larger selected stations. With regard to the progress of the company the sales of kWh for the domestic load had increased by 20 per cent., and yet, with the low rates of charge in force, while there had been 13 million more kWh sold in London for ordinary domestic supplies, the revenue from this was some £10,000 less than the previous year; reductions given to consumers last year amounted to £168,000. The lighting of about 257 miles of streets was being reconstructed, entailing the erection of over 8,000 electrical equipments. Large numbers of water heaters and electric infusers were being installed, and they expected this year a heavy demand for refrigerators. Large power and bulk supplies were greater by thirty-three times than the similar supplies ten years ago. In the current year there was an increased output of over ninety-four million kWh for the first two months as compared with the same period last year, the C.E.B. taking fifty-eight million kWh extra and the company thirty-six million kWh. The parent company and its subsidiaries operated over 3,000 sq. miles, excluding areas where they had bulk supply powers, and they sold 1,300 million kWh to 400,000 consumers. They had fifty-five branches and depôts, fifty-three showrooms, and 3,358 substations, and during the past nine years the number of employés had increased by 300 per cent.

The Scottish Power Co., Ltd.—Presiding at the annual meeting held on March 20th, Mr. G. Balfour (chairman) said that their hydro-electric plants at Rannoch and Tummel continued to give excellent service; the third 16,000-kW turbo-generator set and pipeline had now been completed and they had been put into commission. The installation of the plant and equipment at these stations was now complete and ready for generating additional power as soon as they were able to utilise water from the Garry watershed.The tunnel from Loch Garry to Loch Ericht and the intake dams, &c., should be complete and available for service during the summer of 1937, enabling them to increase the capacity of their existing power stations by 11,000 kW. The only other water resources which remained to be developed to generate additional power in the Rannoch and Tummel power stations were the Killichoran, Loch Seilich, and Loch Cuaich. These works would be taken in hand shortly, and when completed would increase their water supply, enabling them to provide an additional 11,000 kW from their existing generating plant. The impounding of the water from the additional watersheds in the Ericht reservoir provided for the generation of an additional 22,000 kW from the plant already installed in the Rannoch and Tummel stations. They had continued during the year their intensive "Scotesco" propaganda and a great deal of good work had been done by the salesmen in their travelling demonstration vans and by lady demonstrators. The total addition to their h.p. and l.p. mains during the year was 417 miles, and the subsidiary companies had now over 2,438 miles of h.p. and l.p. lines and cables, of which 1,560 miles were overhead and 878 miles underground. New consumers connected amounted to 7,654, making the total 50,361. They connected 29,400 kW of additional load, making the total 175,200 kW, and resulting in a maximum demand of 80,500 kW. Supplies were inaugurated in five burghs and twenty-four villages, making a total of seventy-nine burghs and 182 villages supplied to date. They also entered into nineteen additional street-lighting agreements. The sales totalled 236,400,000 kWh, excluding inter-company bulk supply, an increase of 27,600,000 kWh; 115,770,000 kWh was sold to the Central Electricity Board, the balance being sold in the company's areas. Excluding bulk supplies, the average price per kWh sold was 1.37d. An issue of 570,000 ordinary shares of £1 each was made during the year. At the conclusion of the meeting a resolution was passed authorising the conversion of the issued preference and ordinary shares into stock.

London Associated Electricity Undertakings, Ltd.—Presiding at the annual meeting on March 19th, Lord Wargrave (chairman), said that the object of the merger of six of the London electricity supply companies was to bring together in one organisation all the resources of the constituent companies, and that this amalgamation had been carried out at a total expense of £7,300. The board, in collaboration with the boards of the constituent companies, had succeeded in effecting a reduction in the lighting rate in two of the companies' areas, and had published a uniform two-part tariff and standardised conditions of supply for the six areas. It was hoped that before the summer was out they would be able to put before consumers a system of tariffs at least as favourable as any other in the country, and showing a considerable amount of uniformity in price and a reduction in numbers. They had also introduced throughout the six companies' areas standardised hire systems, and it was anticipated that a standardised hire-purchase and other systems of consumers' assistance schemes would shortly be available. They had already achieved some economy in the provision of such items as cable, meters, and the various kinds of apparatus sold or hired to consumers. Mr. Riviere, the chief engineer of the Westminster company, had been appointed engineer-in-chief of their company, and the retiring chief engineers had been appointed advisory engineers. It was intended that they should enter into an agreement with each of the constituents to manage the companies until 1971, and the agreement was now before the Electricity Commissioners for their approval.

Mr. C. Parker (joint managing director), said that the sales last year increased by 36,000,000 kWh to 350,000,000 kWh, and the connected load by 39,000 kW to 489,000 kW. The average price per kWh charged to consumers was 1.682d., as compared with 1.804d. per kWh for the previous year. There was an amount outstanding of £118,000, representing the cost of changing consumers' apparatus from d.c. to a.c. and the cost of change of frequency remaining to be provided for. This would be written off over a period of years. The constituent companies during the year provided the sum of £97,500 for this purpose, and at the present time the standard a.c. system of supply represented 60 per cent. of the total supply given by the constituent companies.

The Bournemouth & Poole Electricity Supply Co., Ltd., reports a net revenue for 1935 of £167,014, as compared with £165,616 for the preceding year, which, with £16,500 brought in, makes £183,514. After deducting debenture interest, &c., and placing £40,000 to reserve for depreciation, renewals, &c., there is a balance of £115,235. The ordinary dividend for the year is maintained at 15 per cent. by the final distribution of 9 per cent., and £17,077 is carried forward. Sales of electricity totalled 36,462,450 kWh, as against 33,739,100 kWh, and the number of consumers increased by 6,576 to 43,630. The company has acquired the Milford-on-Sea Electric Supply Co., Ltd., by an exchange of shares, and the ordinary share capital has been increased accordingly. It is proposed to convert the ordinary shares into ordinary stock. The change-over of the system to the standard frequency is now completed, and the Bourne Valley power station has accordingly been closed down. Supply was made available during the year to a number of districts, and arrangements have been entered into to give a supply of electricity in bulk to the subsidiary companies, the Milford-on-Sea and the Milton and Barton-on-Sea companies, and also to the Lymington Electric Light & Power Co., Ltd. Reductions in the electricity charges have been announced, together with a special water heating rate to take effect as from January 1st last. Contracts have been obtained from Bournemouth Corporation for over nine miles of main street lighting, and for heating by electricity the new Bournemouth Baths. Meeting: March 31st.

Enfield Cable Works, Ltd.—Presiding at the annual meeting held on March 19th the Earl of Verulam (chairman) said that the general all-round improvement in their trade referred to last year had continued through 1935, and the first months of the current year showed no falling off. They were, to some extent, reaping the benefit of the grid scheme, for by taking a supply to sparsely populated areas the Central Electricity Board had given a fillip to the cable industry. Feeder lines were now being constructed in areas where, if it had not been for the grid, no electricity undertaking would have been tempted to give a supply at a price that could compete with other forms of power. Railway electrification was extending and the Post Office was placing considerably increased orders for telephone cable. These things had helped to swell their order book and to improve the load factor in every department of their works. Thus, in spite of the competition of several newcomers to the industry, they had secured an increased turnover in 1935. The prospects for 1936, on the supposition that the political crisis in Europe would be successfully dealt with, were very encouraging, and they were in a position to secure their full share of such business that was going. The board had appointed Lord Forrester and Messrs. F. Plutte, junr., and A. Edward Flaskett to be directors of the company.

The British Power & Light Corporation, Ltd., reports a revenue for the year ended December 31st last of £178,583, as compared with £100,373 for the preceding nine months. After deducting directors' fees, expenses, &c., there is a net profit of £143,016 (against £78,741), which, with £23,292 brought in, makes £166,309. The final ordinary dividend is 4 per cent., making 6 per cent. for the year, and £41,195 is carried forward. The sales of electricity for general purposes by the North Wales Power Co. (a subsidiary) increased by 14 per cent. to 92,000,000 kWh. The number of consumers connected to the systems of the English distribution companies increased during the year from 13,144 to 15,999; domestic supplies increased from 4,750,000 to over 6,750,000 kWh, and power supplies by 500,000 kWh to 3,500,000 kWh. At the annual meeting to be held on March 31st a resolution will be submitted for increasing the capital to £3,250,000 by creating 450,000 ordinary £1 shares. As already announced, it is proposed to offer 338,123 ordinary shares to ordinary stockholders at 25s. each in the proportion of one share for every £5 of stock held.

The Morgan Crucible Co., Ltd., reports a net profit for 1935 (including profits, less losses of subsidiaries) of £368,421, as compared with £356,908 for 1934. The dividend on the ordinary stock for the year is maintained at 1s. 4½d. and £214 is carried forward.

The Midland Electric Corporation for Power Distribution, Ltd., reports a revenue for 1935 of £466,455, as compared with £410,445 in 1934, and a profit of £108,362 (against £95,668). After deducting debenture interest, &c., there is a balance of £90,450, which, with £34,509 brought in, makes £124,959. Reserve receives £20,000 and the ordinary dividend is 8 per cent., leaving £36,243 to be carried forward. In 1934 the ordinary distribution was 8 per cent., plus a capital bonus of 33⅓ per cent. The report states that during the year 7,822 new consumers and 17,344 kW of demand were connected. The sales of electricity increased by 17 per cent. over 1934. Capital extensions to the distribution system amounted to £332,123, and to assist in meeting this an issue of £300,000 of 3¼ per cent. debentures was made in September last. Meeting: March 31st at Liverpool.

The Mersey Power Co., Ltd., held its annual meeting on March 19th, when Mr. H. J. Falk (chairman), who presided, in reviewing the revenue account, said that the receipts were larger, those from the sale of electricity rising from £201,813 to £226,586, more than half of this expansion being for domestic purposes. The revival of trade also provided a considerable increase in electricity for various works and in bulk supplies. They supplied 68,082,562 kWh in 1935, as compared with 57,935,916 kWh in 1934. This growth continued and was mainly due to their having made their connections well in advance. They added sixty miles to their cables last year, bringing the total up to 481 miles. The connections rose by 3,022 to 20,297 and the percentage of premises connected had now reached 73.2, but the population still grew, and so did the various industries in the area.

Ericsson Telephones, Ltd., reports a trading profit for 1935 of £174,709, as compared with £133,994 in the preceding year, and a net profit of £112,428 (against £84,710). It is proposed to pay a final ordinary dividend of 10 per cent., and a bonus of 5 per cent., making the total distribution for the year 20 per cent., tax free. This is payable on capital enlarged by the distribution of a capital bonus of 25 per cent. last year. The distribution for 1934 was 24 per cent., less tax. General reserve receives £20,007 and £37,917 is carried forward. The report states that the output from the factory was substantially increased and the department engaged in the production of electric totalisators has secured a considerable volume of business. Orders in hand show an increase. Meeting: April 2nd.

Associated Electrical Industries, Ltd., reports a balance for 1935, after deducting expenses, of £828,519, as compared with £586,882 for the preceding year. Debenture interest absorbed £21,155, depreciation £91,832, and income tax £179,674, leaving a net profit of £535,858 (against £325,237), to which is added £113,336 brought in, making £649,194. The ordinary dividend for the year is 8 per cent. (against 6 per cent.), and £165,405 is carried forward. The report states that the output was maintained at a high level during the year and the volume of orders received was satisfactory as compared with previous years. Orders in hand at December 31st were on a higher level than at the end of 1934. During the year the whole of the £1,036,353 four per cent. mortgage debenture stock was redeemed, the sum required being found out of liquid resources. Meeting: April 2nd.

The British Thomson-Houston Co., Ltd., reports a profit for 1935, after deducting expenses, income-tax, &c., of £476,633, as against £356,435 for the previous year. Debenture and loan interest absorbed £76,785 and depreciation, &c., £177,742, leaving £222,106, which with £250,813 brought in makes £472,919 available. General reserve receives £132,849, and it is proposed to pay an ordinary dividend of 5 per cent. (against 3 per cent.), leaving £181,197 to be carried forward. The report states that improved industrial conditions continued during the year and orders received and the output from the company's works were greater than for the previous year, while the orders on hand at December 31st last showed a substantial increase over those at the end of 1934. Meeting: March 26th.

The Edison Swan Electric Co., Ltd., reports a trading profit for 1935, after providing £25,000 for contingencies, of £91,101, as against £56,907 for 1934, and a profit on the sale of property and investment of £5,147. After providing for interest and depreciation there is a balance of £59,392. Of this, £12,162 is allocated for income-tax and £20,000 is placed to special reserve. The ordinary dividend for the year is 10 per cent. (against 6 per cent.), and the amount carried forward is £22,230 (against £15,648 brought in).

The Richmond (Surrey) Electric Light & Power Co., Ltd., reports a net revenue for 1935 of £30,704, as against £32,484 for 1934, which, with £2,438 brought in, makes £33,143. Reserve for depreciation, renewals, &c., receives £8,000. An interim dividend of 4 per cent. has been paid on 200,000 ordinary shares, and it is proposed to pay a final dividend on 310,000 ordinary shares of 4½ per cent., leaving £1,697 to be carried forward. The sales of electricity totalled 9,213,355 kWh, an increase of 1,106,006 kWh. As from the beginning of the year reductions have been made in the two-part tariff both for domestic and business consumers, together with a reduction in the lighting flat rate for slot-meter consumers. A contract was obtained during the year for lighting the principal thoroughfares in the town.

The South London Electric Supply Corporation, Ltd., reports a net revenue for 1935 of £96,311, as compared with £103,991 in the preceding year. After providing for debenture interest, contributions to sinking funds, &c., it is proposed to pay a final ordinary dividend of 4 per cent., maintaining the distribution for the year at 7 per cent., and to carry forward £13,339. The sales of electricity totalled 46,105,262 kWh, as against 41,943,970 kWh, and the number of consumers was 28,188, an increase of 4,235. Meeting: March 31st.

The South Metropolitan Electric Light & Power Co., Ltd., reports a net revenue for 1935 of £192,737, as compared with £197,070 for the preceding year. It is proposed to pay a final ordinary dividend of 6 per cent., making 9 per cent. for the year (unchanged) and to carry forward £46,685. The sales of electrical energy increased by 15,552,771 kWh to 113,338,270 kWh, and the number of consumers by 5,618 to 40,738. Meeting: March 31st.

British Insulated Cables, Ltd., reports a profit for the year ended December 31st last of £672,591, as compared with £558,760 in the preceding year, to which is added £301,387 brought in, making £973,978. From this is deducted debenture interest, &c., and after appropriating £125,000 for depreciation and £100,000 for reserve, it is proposed to pay a final ordinary dividend of 10 per cent., making 15 per cent. for the year, plus a cash bonus of 5 per cent., both less tax, leaving £303,860 to be carried forward. Meeting: March 31st at Liverpool.

The British Aluminium Co., Ltd., reports a net profit for 1935 of £436,449, as compared with £389,178 in the previous year. As announced in our last issue, the ordinary dividend for the year is maintained at 7½ per cent., less tax, and £62,227 is carried forward. In accordance with the terms of the capital issues made in June, 1934, the whole of the £3,500,000 4 per cent. mortgage debenture stock was issued by the end of the year and the outstanding balance of the old 5 per cent. first mortgage debenture stock, amounting at that date to £632,474, was duly redeemed on January 1st last. Meeting: March 31st.

The Great Northern Telegraph Co., Ltd., proposes for the year 1935 to distribute a total dividend and bonus of 20 per cent., including the 5 per cent. already paid. From interest on reserves, totalling Danish kroner 6,070,901 (£271,022), it is proposed to transfer to the revenue account Kr. 6,070,000 (£270,982), which is Kr. 30,000 (£1,339) less than in the previous year. Interest from other sources, amounting to Kr. 149,129 (£6,658), shows a decrease of Kr. 109,210 (£4,875). To the pension fund has been allotted Kr. 525,000 (£23,437), and it is proposed to carry forward Kr. 10,863,778 (£484,990).

The Anglo-Portuguese Telephone Co. has declared a final dividend of 5 per cent. on the fully-paid ordinary shares, making 8 per cent. for the year (same), and a dividend of 8 per cent. on the "A" ordinary shares (unchanged) The ordinary shares issued last November do not rank for the dividend now announced.

Companies to be Struck off the Register.—The names of the following companies will be struck off the Register at the expiration of three months unless cause is shown to the contrary:—Eros Electric Lamp Co., Ltd.; Pearl Electrical Co., Ltd.; Phonophones, Ltd.

The International Telephone & Telegraph Corporation (U.S.A.) has by public advertisement announced that it has limited alien ownership of its capital stock to twenty per cent. of the stock outstanding in view of certain provisions in the Federal Communications Act of 1934.

Hopkinsons, Ltd., have declared a final dividend of 6 per cent. on the ordinary shares, making 8½ per cent. for the year ended January 31st last (against 5 per cent. for the previous year).

The Shanghai Electric Construction Co., Ltd., is paying a final dividend of 9 per cent., making 13 per cent. for the year (same).

The Swedish General Electric Co. ("A.S.E.A.") reports an increase in net profit from £248,500 in 1934 to £349,000 last year. A dividend of 7 per cent. is being paid.

The Canadian General Electric Co. has announced a dividend on the common stock of $1.25 a share for the quarter ending March 31st.

Stocks and Shares

TUESDAY EVENING.

THE tension that has prevailed in political circles is the reason why business in stocks and shares has fallen away to a mere trickle. Compared with the activity prevailing a month or six weeks ago, the present condition of affairs in the Stock Exchange market is as remarkable for its quietude as then it was for its activity. People ask nowadays what connection there can be between aggressive intransigeance on the part of the German Dictator and the prospective profits say, of an electrical manufacturing company working at home. A very little consideration will show, however, that the former factor has a marked influence over the willingness of capital to seek any permanent form of investment at a time when international politics are in a thoroughly disturbed condition. The curious bond called sympathy that links one Stock Exchange market to another, is frequently derided as illogical and unreasonable. But familiarity with its working, and a little thought devoted to the subject, will make it clear that some common sentiment is certain to be found in operation amongst financial markets. So far as this affects the electrical departments, it will be noticed, from reference to our price-lists, that the latter have been comparatively little altered by the prevailing conditions. No doubt this is due very largely to the fact that electrical manufacturing companies are doing extremely well at the present time. The British Insulated Cables report, showing an increase in the year's profit of £113,800, makes a case in point.

Electricity Supply Shares

The surface of the market in the shares of electricity supply companies remains unruffled by European breezes. The amount of business being transacted is very small, and, as our list shows, there are few price changes of any importance. Reports and accounts issued by the South London, South Metropolitan and Bournemouth and Poole Companies contained nothing likely to influence the prices of the shares. In each case, output of electricity has again materially increased, but net profits show little alteration either way, and dividend-rates are unchanged. Clyde Valleys, North Easterns and Scottish Power all improved on encouraging statements

made at the annual meetings of increased output due to improved industrial conditions in the North. Scottish Power gained 1s. 3d. to 41s. 3d. ex dividend. British Power and Light rose 9d. further to 33s. 3d. ex-dividend by reason of the expansion of profits shown in the Corporation's report. Newcastles dropped another 1s. to 36s. after the annual meeting. North Metropolitans improved by 1/16 to 3. Among foreign supply companies, Palestine "A" shares improved 1s. 6d. to 51s. 6d.; Jerusalem ordinary are easier at 2. The demand for electricity for industrial use in Palestine is reported to be growing rapidly. Peraks, at 23s. 9d., and Calcuttas, at 61s. 6d., are both steady at their previous levels.

Manufacturing and Equipment Shares

Politics are perforce the dominating influence over the industrial market as a whole. Electrical equipment shares are not excepted. Prices are being carried on the ebb and flow of public confidence in the outcome of the present negotiations for peace in Europe. The market is standing firm in the face of uncertainty, and although most shares are naturally at lower levels than those which prevailed before the Rhineland crisis, some improvement has taken place during the past week.

Associated Electricals were at one time inclined to give ground, but reports of higher profits and dividends from the British Thomson-Houston and Edison Swan companies, in both of which concerns the A.E.I. has a large stake, helped to restore the price to 45s. General Electrics also recovered from an initial decline, and gained 6d. to 78s. 6d. Shares of cable manufacturing companies held their ground. Enfields rose 1/16 to 6 3/16 after the annual meeting. Enfield Rolling Mills lost 1s. at 26s. The full report issued by Ericsson Telephones made a good impression, and the shares are 3/16 higher at 2 3/16. At this price the yield on the money is barely 2¼ per cent. tax free, but the financing of recent expansion by bank loans, as shown in the accounts, is taken by some people to be the forerunner of a fresh issue on bonus terms to shareholders. Further consideration of the satisfactory figures in the International Automatic Telephone Company's accounts brought about some improvement in the shares. The ordinary and "B" deferred rose 1s. each to the common level of 45s. Lancashire Dynamos are about 1s. 9d. better at 41s. 6d.; Westinghouse Brakes rose 1s. to 3. Reyrolles at 71s. have shed 1s.

Telegraphs, Telephones and Tractions

Cable and Wireless stocks received support following publication of the traffic index for February. The "A" stock made headway from 26¼ to 27½, but the preference and "B" stocks hung fire. Although the figures for February are better than the previous month's, they are not so good as those for the corresponding period of 1935. International Telephone and Telegraphs are lower at 16⅝, but Western Unions gained 2 to 88. American "Tel. and Tel." fell abruptly from 169½ to 162½ on the news that alien ownership is to be restricted to 20 per cent. of the company's capital stock. Radio Corporations recovered well from 12 to 13¾, but Canadian Marconis fell 6d. to 8s. 6d. Brazilian Tractions at 12⅝ have repeated the previous week's loss of ⅜, there being rumours of fresh internal dissensions in the country. Hydro-Electrics, after touching 8¼, reverted to 8⅛. International Holdings are weak at 1⅞.

The American Floods

The floods which have been doing so much damage in the north-east corner of the United States, and which, in some districts, have reached record proportions, are thought likely to have an indirectly favourable effect upon the shares in the American companies concerned with constructional and reorganisation work. The electric lighting and power undertakings may be expected to benefit where they have not themselves suffered any great damage by reason of the waste of waters. Some little effort seems to have been made in the Wall Street Stock Exchange to discriminate between the shares of companies, such as those of the railroads operating in the flooded areas, from shares in utility companies that may, by-and-by, derive advantage through rebuilding programmes. At present, however, the first shock of the visitation is the outstanding feature. There is a disposition to leave Americans alone for the time being, until it becomes more apparent how far the losses will extend.

Miscellaneous Matters

Broadcast Relay Services have slumped to about 6s. 9d. by reason of the recommendation of the Broadcasting Committee that broadcast relay exchanges should be taken over by the Post Office at the end of the current year. The Post Office has the power to acquire these exchanges at a bare minimum of cost. McMichael Radios hardened to 3s. on the disclosure of a spectacular recovery in profits. E. K. Coles at 24s. 6d. and Electric and Musical Industries at 27s. 6d. are each a few pence lower. Vactrics remain at 23s., and British Vacuum Cleaners improved 1/16 to 32s. 6d. Electrolux Corporations fell a point to 24¾. A rise of 1s. 6d. lifted Revo Electrics to 39s. 9d.

Thomas Tilling shares were marked ex rights on Monday in this week, and are now quoted 62s. 6d. British Electric Traction deferred at 152⅝ is 25 points down. The rubber market is firm, with the raw produce at 7⅛d. per lb., but business in rubber shares has shrunk to negligible proportions.

Share List of Electrical Companies

	Nom.	Dividend. 1933.	Dividend. 1934.	Price Mar. 24.	Rise or Fall.	Yield £ s. d.
HOME ELECTRICITY COMPANIES.						
Bournemouth and Poole	1	15	15	3¾xd.	—	3 18 8
City of London	1	7½	7½	37/6xd.	—	4 0 0
Clyde Valley	1	7	8	44/6xd.	+6d.	3 12 0
County of London	1	10½	10½	57/-	—	3 13 8
Edmundson's 7% Pref.	1	7	7	36/-	—	3 17 9
Do. Ord.	1	7	8	45/-	—	3 11 1
Elec. Dis. Yorkshire	1	9	9	47/-	—	3 16 7
Elec. Fin. and Securities	1	12½	12½	3 7/8	—	5 12 9
Elec. Supply Corporation ...	1	11	11	64/6	—	3 8 3
Lancs Light and Power	1	7½	7½	39/-	+6d.	3 17 0
Lond. Assoc. Electric	1	—	—	34/-xd.	—	4 2 4
London Electric	1	7	8	40/-	—	4 0 0
London Power Deb. Red. ...	Stock	5	5	107½	—	4 13 0
Metropolitan	1	10	10	52/-	—	3 17 0
Midland Counties	1	7	7½	2	+6d.	3 15 0
Mid. Elec. Power	1	8	8	42/6	—	3 15 3
North Eastern Electric Ordinary	1	6	6	33/6xd.	+6d.	3 11 8
Do. 7% Pref. ...	1	7	7	34/6xd.	—	4 1 2
Northampton	1	10	10	52/6	—	3 16 2
Notting Hill 6% Pref.	10	6	6	14½	—	4 2 9
North Met. Elec. Ordinary ...	1	10	10	3	+1/8	3 6 8
Do. do. 6% Pref. ...	1	6	6	32/-	—	3 15 0
Scottish Power	1	8	8	2 1/8xd.	+1/8	3 17 7
South London	1	7	7	35/-xd.	—	4 0 0
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	25/6xd.	—	5 17 8
Yorkshire Elec.	1	8	8	46/-	—	3 9 7
PUBLIC BOARDS.						
Central Electricity, 1950–70 ...	Stock	5	5	116½	+½	4 5 10
Do. 1955–75 ...	,,	5	5	119	—	4 4 0
Do. 1951–73 ...	,,	4½	4½	112	—	4 0 4
Do. 1963–93 ...	,,	—	3½	103	—	3 8 0
London Elec. Trans. Gtd. ...	,,	—	2½	96½	—	2 11 10
London & Home Counties, 1955–75	,,	4½	4½	112	—	4 0 4
London Passenger Transport, A...	,,	—	4½	124½	—	3 12 4
Do. do. B...	,,	—	5	127	—	3 18 9
Do. do. C...	,,	3½	4	105	—	3 16 2
West Midlands Joint Elec. 1948–68	,,	—	5	116½	—	4 5 10
TELEGRAPH AND TELEPHONE.						
American Tel. & Tel.	$100	9	9	162½xd.	−7	5 10 9
Anglo-Am. Tel. Pref.	Stock	6	6	124½	—	4 16 5
Do. Def.	,,	1½	1½	29	−½	5 3 5
Cable & Wireless 5½% Pref. ...	,,	2¾	4½	107½	+½	3 16 9
Do. A. 7½% Ord.	,,	Nil	Nil	27½	+1½	—
Do. B. Ord.	,,	Nil	Nil	7½	—	—
Globe Tel. & Tel. Ord.	10	2½	3½*	16	—	2 3 9
Do. do. Pref.	10	6	6	14	—	4 4 3
Great Northern Tel.	10	20	20	43	—	4 13 0
Marconi-Marine	1	10	7½	33/9	—	4 9 0
Oriental Telephone Ord.	1	12	12	3½	—	3 13 10
HOME AND FOREIGN TRAMS, ETC.						
Anglo-Arg. Trams First Pref. ...	5	Nil	Nil	1/3	—	—
Do. do. 2nd Pref.	5	Nil	Nil	9d.	—	—
Do. do. 5% Deb.	Stock	Nil	Nil	6	—	—
British Electric Traction Df. Ord.	,,	5	5	1525	−25	—
Do. do. Pref. Ord.	,,	8	8	179½	—	4 19 2
Brazil Traction	100	—	—	12⅝	−⅜	—
Brit. Columbia Elec. Rly. Pce. ...	Stock	5	5	99½	—	5 0 6
Mexican Light Common	100	Nil	Nil	5½	—	—
Do. 7% Pref.	100	7	7	6½	—	—
Do. 1st Bonds	$500	5	5	57½	—	—
Victoria Falls Ord.	1	20	20	3¾	—	—
West Riding	1	5	6½	52/6xd.	—	2 9 6
MANUFACTURING COMPANIES.						
Aron Electricity Ord.	1	10	15	66/3	—	4 10 7
Assoc. Elec. Ord.	1	6	8	45/-xd.	—	3 11 1
Do. Pref.	1	8	8	38/-	—	4 4 3
Babcock & Wilcox	1	6	8	55/-	+3d.	2 18 2
British Aluminium Ord.	1	5	7½	43/9	+9d.	3 8 8
British Insulated Ord.	1	15	25	5	—	4 0 0
Brush Ord.	Stock	Nil	Nil	42½	—	—
Callender's	1	15	15	4	—	3 15 0
Do. 6½% Pref.	1	6½	6½	31/3	—	4 3 2
Crompton Parkinson Ord. ...	5/-	—	12½	65/-	—	0 19 3
Do. 8% Pref.	1	8	8	38/9	—	4 2 7
Edison Swan 1st Pref.	1	7½	7½	30/-	—	5 0 0
Electric Construction	1	Nil	3½	1⅝	—	2 0 0
Enfield Cable Ord.	1	25	25	6 5/8	+1/8	4 0 10
English Electric	1	Nil	Nil	19/-	−6d.	—
Do. do. Pref.	1	Nil	Nil	22/6	+6d.	—
Ericsson Tel.	5/-	24	20*	2 3/8	+1/8	2 5 8
Ever Ready	5/-	35	35	24/3	—	7 4 4
Ferranti Pref.	1	7	7	26/9	+6d.	5 4 8
G.E.C. Pref.	1	6½	6½	34/-	—	3 16 6
Do. Ord.	1	8	10	78/6	+6d.	2 11 0
Henleys	1	30	30	7⅛	—	4 1 4
Do. 4½% Pref.	5	4½	4½	5⅛	—	3 18 3
India-Rubber Preferred	1	—	5½	1¼	—	4 17 9
Johnson & Phillips	1	5	7½	46/3	—	3 4 10
Siemens Ord.	1	6½	4	27/6	—	2 18 2
Telegraph Construction	£1	Nil	Nil	27/6	—	—

* Dividends are paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings will be taken.

1934

15779. "Container and arrangements for Braun tubes." Radio-Akt. Ges. D. S. Loewe. May 27th, 1933. (443484.)

21207. "Portable television apparatus, more particularly for military and police purposes." Radio Akt.-Ges. D. S. Loewe. July 21st, 1933. (443286.)

21765. "Inertia-operated electric switch." C. E. Wise. July 25th, 1934. (Cognate application 21766/34.) (443288.)

21775. "Tuning of radio receivers." Murphy Radio, Ltd., G. B. Baker and G. F. Hawkins. July 25th, 1934. (Cognate application 34831/34.) (443423.)

21823. "Tuning of radio receiving apparatus." E. K. Cole, Ltd., and G. Bradfield. July 26th, 1934. (443363.)

21824. "Electronic tube." Radio Akt.-Ges. D. S. Loewe. July 26th, 1933. (443364.)

21940. "Wire broadcasting systems." P. P. Eckersley and R. E. H. Carpenter. July 26th, 1934. (443366.)

24178. "Electric condensers." R. H. L. Bevan and G. W. Harris. August 22nd, 1934. (443217.)

24208. "Electric protective arrangements." A. Reyrolle & Co., Ltd., B. H. Leeson, H. Leyburn, and C. Freeland. August 22nd, 1934. (443218.)

24211. "Telephone systems." Siemens Bros. & Co., Ltd., and B. A. Hensler. August 22nd, 1934. (443220.)

24233. "Multiple-filament electric lamps." R. Terrell. August 22nd, 1934. (Cognate application 35350/34.) (443221.)

24320. "Electric switches operated by a liquid." A. C. Potter. August 23rd, 1934. (443227.)

24353. "Electric rotary switches." Diamond H. Switches, Ltd. (G. H. Hart). August 23rd, 1934. (443488.)

24361/2. "Translating mechanism for telegraphic printing, recording, registering and like apparatus." Creed & Co., Ltd., and R. D. Salmon. August 23rd, 1934. (443231/2.)

24364. "Regenerative repeaters for telegraph signals." Creed & Co. and R. D. Salmon. August 23rd, 1934. (443233.)

24418. "Dynamo-regulating devices." C.A.V.-Bosch, Ltd., and W. H. Glaser. August 24th, 1934. (443238.)

24442. "Telephone systems." C. Lorenz Akt.-Ges. November 18th, 1933. (Cognate application 24443/34.) (443374.)

24548. "Short-wave radio systems and apparatus." Marconi's Wireless Telegraph Co., Ltd. August 31st, 1933. (443426.)

24591. "Electrolytic production of bright metallic deposits." M. Schlötter. June 5th, 1934. (443428.)

24592. "Electrolytic production of bright deposits of tin." M. Schlötter. June 5th, 1934. (443429.)

24608. "Control of electric horns for road vehicles." J. Lucas, Ltd., and L. R. Neill. August 27th, 1934. (443430.)

24640. "Electric insulators." British Thomson-Houston Co., Ltd. August 26th, 1933. (443434.)

24780. "Electrical apparatus for heating rooms and buildings." General Electric Co., Ltd., and J. Stinton-Jones. August 28th, 1934. (443297.)

24936. "Electric portable welding appliance." New Process Welders, Ltd., F. C. Hohs and W. J. Gladitz. August 29th, 1934. (443437.)

25858. "Electric switches of the ceiling or pull-operated type." Wandsworth Electric Manufacturing Co., Ltd., and T. Batchelor. September 8th, 1934. (443500.)

26993. "Tuning of radio circuits." E. K. Cole, Ltd., A. W. Martin, and F. A. Inskip. September 20th, 1934. (443505.)

28893. "Control apparatus for grid-controlled electric discharge vessels." Siemens-Schuckertwerke Akt.-Ges. October 9th, 1933. (443304.)

30738. "Electrode lead-ins for vacuum discharge apparatus with metal vacuum vessels." W. Lehmann. October 30th, 1933. (443256.)

30760. "Dielectric materials." British Thomson-Houston Co., Ltd. October 27th, 1933. (443257.)

30875. "Methods of construction of wireless aerial systems." Aero-Electrical Equipment Co., Ltd., E. N. Elford and W. H. Slinn. October 27th, 1934. (443258.)

33151. "Withdrawable electric switchgear." G. Ellison and H. T. Stratton. November 17th, 1934. (443387.)

33505. "Electric incandescent lamps for aerodrome floodlights and beacons." Chance Bros. & Co., Ltd., and J. G. Holmes. November 21st, 1934. (443511.)

35033. "Switch arrangement for electric lamps." Ruppelwerke Ges. February 23rd, 1934. (Cognate application 35035/34.) (443390.)

35810. "Mounting of electric switch blades." B. Hesketh. December 13th, 1934. (443391.)

36480. "Electric cooking ranges." G. Wilkinson. December 20th, 1934. (443309.)

37188. "Scanning devices for television and like systems." Scophony, Ltd., and J. H. Jeffree. December 28th, 1934. (443393.)

1935

183. "Portable electric battery lamps." Concordia Elektrizitäts Akt.-Ges. March 3rd, 1934. (443515.)

649. "Electrical welding or like processes." General Electric Co., Ltd., and E. J. Guttridge. January 8th, 1935. (443518.)

939. "Synchronising systems for telegraphy." International Business Machines Corporation. February 15th, 1934. (443519.)

4480. "Transportable electric welding device." P. N. Lvov. February 12th, 1935. (443461.)

4679. "Automatic connection exchanges, e.g., telephone exchanges." M. B. Richter (trading as Telefon-Fabrik Automatic Ved M. B. Richter. February 13th, 1935. (Convention date not granted.) (443313.)

4810. "Radio receiver." Hazeltine Corporation. October 3rd, 1933. (Divided out of 27502/34.) (443270.)

10371. "Electric lampholders, plug-in sockets, or adaptors, and the like." D. C. H. Copping. April 3rd, 1935. (443466.)

17689. "Electric burglar alarms." A. Angus. June 20th, 1935. (443329.)

18443. "Indirectly heated cathodes for electric-discharge tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. August 13th, 1934. (443535.)

18515. "Gas or vapour-discharge convertor having a metal container." English Electric Co., Ltd. June 28th, 1934. (443331.)

19956. "Insulating material." V. Hermansen and O. Wiig. July 14th, 1934. (443334.)

20692. "Circuits for electric-discharge devices." British Thomson-Houston Co., Ltd. July 21st, 1934. (443337.)

20926. "Method of manufacturing contact members for electric-discharge tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. October 4th, 1934. (443411.)

21864. "Automatic electric arc welding systems." British Thomson-Houston Co., Ltd. November 12th, 1934. (443341.)

22929. "Glass envelopes for alkali vapour electric-discharge devices." British Thomson-Houston Co., Ltd. (General Electric Co.). August 14th, 1935. (443343.)

24795. "Electric gas-blast switches." British Thomson-Houston Co., Ltd. September 6th, 1934. (443416.)

25651. "Motor-operated step-by-step electric switches." Landis & Gyr Akt.-Ges. September 20th, 1934. (Addition to 434564.) (443417.)

33365. "Apparatus for the production of zig-zag resistor elements of wire for electrical heating apparatus." Siemens-Schuckertwerke Akt.-Ges. December 22nd, 1934. (Addition to 414553.) (443543.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from March 18th:—

WTF (lettering and design). No. 565681. Class 6. Commutators and commutator bars for electric motors and generators. No. 565682. Class 50. Electrical insulating substances made wholly or principally of mica. Watliff Co., Ltd., Morden Road, South Wimbledon, S.W.19.

Medi-Sun. No. 562119. Class 11. Ultra-violet ray apparatus for curative purposes or in relation to the health of men or animals.—Medical Supply Association, Ltd., 167-173, Gray's Inn Road, W.C.1.

Pyrotenax. No. 565336. Class 13. Electrical conductors with insulated metallic sheath.—Société Alsacienne de Constructions Mécaniques, Mulhouse, France. (British representatives: W. P. Thompson & Co., 12, Church Street, Liverpool.)

TreVita. No. 565482. Class 13. Electric lamps (ordinary).—Wartburg Lamps, Ltd., Imperial Works, Perren Road, Kentish Town, N.W.

Flexella. No. 566240. Class 16. Electric insulators of porcelain or earthenware.—Lionel Robinson & Co., Ltd., 3, Staple Inn, W.C.1.

A Novel Time Recorder

SET in a niche of the wall of Messrs. Berry & Co.'s garage and service station at Kingston Road, Merton Park, S.W., is a metal figure constructed so as to raise its arms and strike a bell at each hour. It was designed by Mr. C. M. Berry and is operated electro-pneumatically from a master-clock inside the premises. The figure is made of sheet iron, bent to form and riveted. Inside it is a cylinder the piston in which causes the arms to move when striking, compressed air being admitted to the cylinder through an electrically controlled valve.

The time recorder at Merton Park, London, S.W.

As the piston reaches its limit of travel it actuates a release valve and expels the expanded air, thus allowing the piston to return in readiness for the next stroke. When it reaches its original position it re-sets the release valve in the closed position. As the hammer of the striking mechanism rises it allows a pair of contacts to close, and so energises the magnet of the electro-pneumatic valve, releasing compressed air into the cylinder. The fall of the hammer trips the contacts apart, and gives a quick break of the circuit. The simplicity of operation does not detract from the effectiveness of the clock, which can be heard for quite an appreciable distance. A six-volt accumulator battery is employed for the electric circuit and the compressed air is drawn from the normal garage supplies. The figure is painted bright red and is a most effective publicity medium.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Abergele.—Municipal buildings and police station, Bee Field site; U.D.C. surveyor.

Addington.—Houses (26), Featherbed Lane; Paish, Tyler & Co., 1, Addiscombe Road, Croydon.

Ashburton.—Houses (24); Torquay Building Co.

Barnstaple.—Houses (50), Derby Road site; borough surveyor. Cinema, Boutport Street, for A. E. Carder, County Garage, Boutport Street.

Bedworth (WARWICKSHIRE).—Reconstruction of the premises of Freeman, Hardy & Willis, Ltd., High Street.

Bexhill-on-Sea.—Houses (29); Building & Public Works Construction Co., Ltd., builders, Swindon. Houses (30); borough surveyor. Shops and offices, Cooden Sea Road; Masters & Sons.

Birmingham.—Extension of Rubery Mental Hospital; Smith Bros., builders, Sparkbrook, Birmingham. Cinema, Bristol Road, for A. Wm. Rogers, 174, Birmingham Road, Wylde Green.

Bournemouth.—Health centre, East Howe; borough engineer.

Bradford.—Library, Haworth Road; city architect.

Brecknockshire.—Isolation hospital, Brecon; county architect.

Brighton.—Shops and houses, Manor Farm estate; Building and Public Works Construction Co., Ltd.

Bristol.—Factory for H. W. Carter & Co., Ltd.

Bromsgrove (WORCESTERSHIRE).—Houses, Marlbrook and Birmingham Road, for the Hixton Housing Co. Houses (99), Perryfields; R. Thompson, architect. Cinema, Rubery, for Hodge Bros., Ltd., Cock Lane, Northfield, Birmingham. Offices, Church Street, for Chappell & Foster, 99, High Street.

Bromyard.—Houses (27); U.D.C. surveyor.

Carlisle.—Houses (760), Upperby Road; P. Dalton, borough surveyor.

Chatham.—Houses (90); W. T. Davis & Son, builders.

Congleton (CHESHIRE).—Houses (24), Borough Road; John Hood, borough surveyor.

Coseley.—Houses (200), Woodcross; G. E. Mitchell, U.D.C. surveyor.

Coventry.—Extensions to Whoberley Public Elementary School; director of education, Council House.

Cwmbran (MONMOUTHSHIRE).—Houses (46); F. G. Bowyer & Sons, builders.

Dagenham.—Electrical work at Becontree Library; F. C. Lloyd, U.D.C. surveyor.

Darlington.—Cinema, Bondgate, for the Union Cinemas, Ltd., 167, Wardour Street, London, W.1 (£50,000); P. L. Browne and Son, Pearl Buildings, Newcastle-on-Tyne, and S. Beverley, 7, Sackville Street, London, W.1, joint architects.

Darwen.—Grammar school, Moss Bridge (£48,491); director of education.

Dumfries.—Cinema and theatre; Alistair MacDonald, architect.

Dundee.—Nurses' home, Maryfield Hospital (electric lighting); city architect.

Ealing.—Houses (30), Malden Avenue; Swannell & Sly, Bridge Street, Pinner. Factory, Gunnersbury, for the Bush Radio, Ltd., Woodger Road, London, W.12.

Edinburgh.—Houses (44) and garages; Lyle and Constable. architects, 3, Hill Street.

Egham.—Houses (32), West End; Council's surveyor, Egham.

Enfield.—Estate development of Gt. Cambridge Road; Six Counties Estates Co., Ltd.

Essex.—Senior school, Braintree, for County E.C.; J. Stuart, county architect, Chelmsford.

Exeter.—Police headquarters, Guildhall site (£60,000); city architect.

Gloucestershire.—Laundry, electrical work, Cirencester Institution, for County P.A.C.; county architect, Gloucester.

Godstone.—Houses (73), Blechingley; Limpsfield and Oxted Building Co.

Gosport.—Houses (200), Avery Lane site; A. Barlow, borough engineer. Library, Lee-on-Solent; G. V. Northcott, builder.

Grangemouth.—Laundry for the Scottish Co-operative Wholesale Society (£47,000); architects, the Scottish Co-operative Wholesale Society, Glasgow.

Great Yarmouth.—Houses, Lawn Avenue, and North Denes; borough surveyor. Bus depôt, St. Peter's Road; Eastern Counties Omnibus Co., Ltd.

Guisborough (YORKSHIRE).—Houses (38); U.D.C. surveyor.

Halifax.—Swimming baths, Clare Hall; Corporation Baths Committee.

Harmondsworth.—Colour film, laboratories, Bath Road; Technicolor, Ltd.

Harpenden.—Public hall; Yeats & Bull, architects, Welwyn Garden City and Kensington, London, S.W.7.

Hastings.—Houses (32), Parker Road, for T. E. Relfe; Jeffery & Wyatt, architects.

Hillingdon.—Extensions to Hospital (£57,977); E. Plaistowe & Sons, Ltd.

Hyde.—Extensions to I.C.I. (Rexine), Ltd., Talbot Road, Newton; Thomas Warrington & Sons, builders, 51, Bennett Street, Hyde.

Irish Free State.—(BALLINASLOE, CASTLEREA, Co. GALWAY).—Electrical installation at the new mental hospital, for the Committee of Management, Ballinasloe Mental Hospital; J. P. Tierney & Co., consulting engineers, 44, Kildare Street, Dublin. (DUBLIN).—National school, Sandymount; Ashlin & Coleman, architects, 7, Dawson Street. (NAVAN, Co. MEATH).—College, for the Very Rev. John Blowick; Jones & Kelly, architects, 17, South Frederick Street, Dublin. (PORTLAOIGHISE).—Clothing factory (£27,000) for Pepper, Lee & Co., Bradford. (SLIGO).—Installation of electric lighting to Town Hall; J. P. Quinn, engineer and borough surveyor, Town Hall.

Kidderminster.—Two schools (800 places); director of education.

Leicester.—Factory, Trafford Road, for H. Roberts, Ltd.

London.—(BERMONDSEY).—Tenements, Bestwood Street; Ram Estate trustees. (BETHNAL GREEN).—Tenements, Dinmont estate (£24,179); Building & Public Works Construction Co., Ltd., 2, Drayton Park Avenue, West Drayton. (CATFORD).—Development of Hazelbank Park estate; Wates (Streatham), Ltd., 98, London Road, Mitcham, Surrey. (CLAPHAM).—Five-storey block of flats, Nightingale Lane; Welling Estate, Ltd., 22, Suffolk Street, S.W.1. (HACKNEY).—Flats, Nesbet Street (£249,185) and Rossington Street (£14,832); Messrs. Josephs, architects, for Borough Council. (HYDE PARK, W.2).—Block of flats, Lancaster Gate; O. Howard Leicester, Bayley Street, W.C.1. (HYDE PARK CORNER, W.2).—Rebuilding St. George's Hospital (£1,000,000); secretary. (ROTHERHITHE).—Factory, Rotherhithe New Road; Wm. Harbrow, Ltd., builders, 214, Rotherhithe New Road, S.E.16. (S.E.1).—Cinemas, Old Kent Road, for the Associated British Cinemas, Ltd., 30, Golden Square, W.1. (STEPNEY).—Dwellings, Limehouse Fields; borough engineer. (CAMBERWELL).—Extensions to Mary Datchelor School (£13,965); Governors. (DALSTON).—Reconstruction of secondary school (£35,910); L.C.C. architect. (HACKNEY).—Central school; L.C.C. architect. (LIMEHOUSE).—Reconstruction of Central and infants' schools, Thomas Street (£20,000); L.C.C. architect. (SOUTHWARK).—Reconstruction of Ruskin School, Avenue Road (£26,787); H. & J. Taylor, Ltd., Canadian House, Hither Green Lane, S.E.13. (WOOLWICH).—Central school; Oliver Hill, architect, 9, Hanover Square, W.1.

Lowestoft.—Houses (104), St. Margaret's Road estate, for Warnes & Sons.

Maidstone.—Public baths (£40,500); Messrs. Cross, architects. School, Plains Avenue; borough surveyor.

Manchester.—Church, Wythenshawe housing estate, for the Unitarian trustees; Rev. A. W. Vallance.

Motherwell.—Laundry for the Scottish Co-operative Wholesale Society (£47,000); the architects, Scottish Co-operative Wholesale Society, Glasgow.

Northolt (MIDDLESEX).—Development of West End Farm estate; T. F. Nash, Ltd.

Olney (BEDFORDSHIRE).—Boot factory for W. Bottesill & Son, Ltd.; Bozeat, Wellingborough.

Patcham (SUSSEX).—Cinema, By-pass road; Hughes, Hain & Co. Flats, London Road; Withdean Court, Ltd.

Penzance.—Extensions to West Cornwall Hospital, St. Clare Street (£25,000).

Pickering (YORKSHIRE).—Houses (34); Paul Rhodes, Ltd., builders, Leeds.

Rawtenstall.—Houses (26), Greendale Avenue; Greendale Land & Building Co., Ltd. Cinema, Bacup Road; United Cinemas, Ltd.

Redditch.—Premises for the Dares Brewery, Ltd., Belgrave Road, Birmingham.

Rhyl.—Cinema (£50,000), electrical work, for Odeon Theatres, Ltd.; H. W. Weedon, architect, Birmingham.

Richmond (YORKSHIRE).—Cinema, electrical work (£14,000), for Swaledale Entertainments, Ltd.; Percy L. Browne & Son, architects, Newcastle-on-Tyne.

Rugby.—Houses (22), the Addison estate; borough surveyor, Benn Buildings, Rugby.

St. Helens (LANCASHIRE).—Houses (95), near New Street, for R. B. Heward.

Saddleworth (LANCASHIRE).—Houses (36); Dixon, Hill & Co., architects, 52, Union Street, Oldham.

Scunthorpe (LINCOLNSHIRE).—Cinema (£40,000) for the Union Cinema Co., Ltd., 167, Wardour Street, London, W.1.

Shropshire.—Three factories, Whittington, Baschurch and Ruyton-Eleven-Town, for the Kraft Dairies, Ltd., Hayes, Middlesex.

Slough.—Houses (70); Salt Hill Construction Co. Masonic hall, Albert Street, electrical work; H. J. Stribling, architect.

Southall (MIDDLESEX).—Factory, for Quaker Oats, Ltd., 11, Finsbury Square, London, E.C.2.

Southend-on-Sea.—Houses (56), Southview estate; borough engineer.

Stafford.—Houses (82), Tillington estate; W. Whittingham, builder.

Stoke-on-Trent.—Houses (108), Cornhill (No. 2) site; city architect.

Stourbridge (WORCESTERSHIRE).—Additions to the Mary Stevens Maternity Home; Martin, Martin & W. H. Ward, architects, 108, Colmore Row, Birmingham. Premises, 41 and 42, High Street, for Montague Burton Estates, Ltd.; staff architects, Hudson Road, Leeds.

Sunderland.—Houses (212), Ford and Ryhope (£62,090); H. Thompson, builder, Castletown.

Todmorden.—Two schools, Rochdale Valley and Burnley Valley, for E.C.

Truro.—Extensions to Royal Cornwall Infirmary (£50,000); W. E. Grenfell, hon. sec.

Wallasey.—Nurses' Home to the Wallasey Hospital; A. J. Aust, honorary secretary.

Warwickshire.—Junior school, Malvern Park, Solihull; county architect.

West Riding.—Extensions to county hall (£128,000), for C.C.; county architect, Wakefield.

Wood Green.—Houses, Perth Road; H. Pearce & Son, Ltd., Arlington Road, London, N.